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THE FUTURE OF THE M. C. B. ASSOCIATION.

By S. P. Bush.

A Member of the Association.

[This article was written while Mr. Bush was Superintendent of Motive Power of the C. M. & St. P. Ry., and was intended for our June number.—Editor.]

The future of the M. C. B. Association is a matter of no small concern to those who regard it with any degree of interest. Up to the present time the basis of the existence of the association and its principle work has been the Rules of Car Interchange. That its work has been valuable and well done is attested by the vast number of car interchanges taking place daily with practically no delay and so few disputes as to be insignificant.

The greatest compliment upon its work lies in the fact that everything that has been done by it has been accepted by the railroads without question and at the present time nearly all of them are subscribers to the rules. But what of the future?

For the last two or three years it is fair to say that the rules have required little or no modification and the annual conventions have little to show for the time and money expended in their support. The rules have been hurried through and a few committees have been appointed, and then—adjournment. The reports of committees have not been very satisfactory as a whole, and have attracted little or no attention. Surely this cannot continue. The railroads will not permit their representatives to attend conventions that do nothing. There must be some manifest direction to the work of the association in order that it may be useful, and it is to be hoped that this will be forthcoming, for there is no want of objects to which it may turn its attention.

Standards have been adopted to some extent, but for some reason these have been few, and in many cases recommended practices have been adopted instead, on the ground that standards were not practicable. But are not all railroads that interchange cars interested in having cars for service that are strong and satisfactory in every particular having not only a few but many parts standardized by the association so that repairs can be made promptly and economically? It may be said that it is impossible to standardize many parts of the car and that few would use the standards. In answer it may be said that it is vastly more important to the railroads that cars should be kept moving in useful service than that they should be held at interchange and repair points awaiting material exactly like the original, that may require many days for its receipt. Is it not a rather narrow view to take of the question at this time? Why cannot the association do in many cases as it did in the case of the coupler in which it adopted certain principles and enough in the way of specific detail to promote interchangeability? What organization or influence is there in the country better qualified to say what constitutes good practice in car construction than the M. C. B. Association? Certainly none. Then why should not the association commence with the wheel and go to the roof and say fairly and squarely without hesitation what it considers best? It not only can but it should say and give satisfactory reasons for saying whether a truck should or should not have lateral motion, whether the bolsters should carry all of the load on the center plates, whether or not roller side bearings are right or wrong, whether the friction principle for draft gear is correct or not, what shall constitute satisfactory draft gear for cars with wooden sills and how draft timbers should be secured, etc., whether they should pass through the body bolster or up to it and what dimensions should be used.

These are a few of the many questions which it can act upon, and having done so, the rules can be made to say that when "A" has "B's" car with broken draft gear the former can apply what the association says is satisfactory, and "B" must receive the car. The M. C. B. Association instead of standing passively by and permitting those inexperienced in car construction to direct, should itself take the initiative and say what shall be done. On the eve of many important developments such as steel construction and high-capacity cars it might with entire propriety and great advantage to the entire country lay hold firmly of the reins and mould public opinion. Finally, the convention would be vastly more interesting and valuable if the discussions of reports were not cut short but made rigorous. Committees would take greater pains in their reports if they knew that the reports were to be fully discussed and probably criticised.

MASTER MECHANICS' ASSOCIATION.*

THIRTY-FOURTH ANNUAL CONVENTION.

Saratoga, N. Y. June, 1901.

The thirty-fourth annual convention of the Association was called to order at 9 a. m. June 18, at Saratoga, New York, by Mr. William S. Morris, President of the Association. After the opening prayer by the Rev. Dr. Joseph Carey the Association was welcomed in a pleasant address by the President of the Village of Saratoga, to which Mr. George W. West, Third Vice-President, responded, suggesting Saratoga as a permanent meeting place because of its popularity with both of the Mechanical Associations.

President Morris then read his address, a thoughtful, comprehensive and inspiring review of the motive power situation, with particular reference to the important part in the development of transportation held by the members of the Association. Because of its specially valuable suggestiveness we depart from usual custom and print a considerable part of it.

ADDRESS OF PRESIDENT MORRIS.

It must indeed be a pleasure to this association to call attention to the state of the art that this congress represents. And while we are too close to the development of transportation to fully comprehend its import, years hence the last three-quarters of the past century will be looked upon as among the periods of greatest importance to humanity, for in them is contained the entire development of railroad transportation, and yet the industry of building steel freight cars, which has been established but three years, uses more steel plate than the requirements of the shipbuilding industry for the entire country.

In two years ending with 1899, the last reported upon by the Interstate Commerce Commission, the freight traffic of the country had increased 30 per cent., while the increase in population is said to have been about 2 per cent. This increased business has been handled with an increase in the number of freight locomotives of but 1.6 per cent., and in freight cars of but 6 per cent. There has been an increase of 52 per cent. in freight traffic in the past six years, and yet only 7½ per cent. increase in the number of freight cars, and 3⅝ per cent. in the number of freight locomotives; but of course there has been a gradual increase in the capacity of the equipment, due to the construction of larger cars and locomotives. In 1894 the average freight train load was 179.8 tons, and in 1899 it was 243.3 tons, or an increase of 35 per cent. In this time there has been an increase of 48.6 per cent. in the number of ton-miles per freight engine, and 43.3 per cent. in the number per freight car. The members of this association can fully appreciate, to accomplish this, who pulled the "laboring oar."

We see too much of the tiresome detail to get a clear view of what it all means; but the consciousness of being a part of the most important development the world has ever known

*Abstracts of the reports and papers will be found in this and the following issues.

should inspire us to-day, for much remains to be done, and in the most difficult and really scientific side of railroad transportation we are the fundamental factor. It is well that we should occasionally remind ourselves of the place we have to fill as an organization, and examine the results we attain, as an incentive to more important achievements, not forgetting the fact that this is a national association.

Under the head of "official duty" most of us need to give more attention to organization, with a view of getting our work into such shape that we can rise above the details occasionally to a level with the larger problems with which we have to deal, and to take, as it were, a birds-eye view of the department and its responsibilities. Furthermore, it ought rarely to be necessary for us to go outside to fill vacancies. To secure an organization rendering this unnecessary requires time and thought, but it will unquestionably pay. We owe it to our subordinates to encourage them by every possible promotion. The organization should begin with apprenticeship and provide for the appointment of the position of head of the department.

The motive power problem during the past year has been met successfully with machines that would have raised a storm of criticism a few years ago. The simple 8-wheel passenger machine of practically recent construction had reached the limit of size under existing conditions, and were the permanent way the only obstacle, additional concentrated axle load should and must be avoided for reliable performance and freedom from heated bearings. In freight service a graduation from the machine of five or six years ago of 160,000 pounds to some of over 250,000 pounds further demonstrates the unusual hauling capacity that has been successfully attempted and accomplished.

The compound locomotive has been with us for several years, and as lately as 1897 it was pronounced by a former president of the association as "still in the balance." We cannot be proud of the fact that its status has not changed since then and that its place has not been defined and established. Many profess belief in compounding, but continue to order simple engines with an occasional few compounds. The compound is either good or bad; if bad, let us have none of it; but if good, we ought to study its good points systematically, and understand where it should be used and how it should be built, for no more creditable, profitable or necessary work can be undertaken by the association than an attempt to get the real merit of the compound. We should not be satisfied to let the compound drag itself wearily along into its final place in our esteem, when with present-day facilities it is easy to forecast so much intelligently and appropriately. I am tempted to say that we ought to have known our own minds before this, and if we do not, an important function of the association on this particular question has not been performed.

Under the head of boilers, to meet the conditions already alluded to in the increase of capacity of locomotives, is observed the wider fireboxes for machines burning bituminous coal. It has been ascertained, however, that wide fireboxes designed for burning anthracite coal will not sucessfully operate with bituminous coal, they having limited depth and a larger grate area than was required; but with convictions that justified the wide firebox for soft coal burning engines, it has been introduced successfully. The requirements being, for large engines, a wide grate with from 45 to 60 square feet and a deep firebox; this explaining the necessity for trailing wheels.

Necessity has urged these conditions in her own way to no little extent, by the demand upon the engineer to accomplish economical means of transportation, which has been forced upon the traffic officer in many ways, through competition and legislation, with its inevitable understanding and demand for lower freight rates. Think of hauling a ton of freight one mile for 3.43 mills! This, gentlemen, was the average earning for the last fiscal year of a line I am very familiar with, and while its rate power decreased 5.25 per cent., the tons of paying freight increased 14.8 per cent. Hence, you will observe the operating fully met the necessities and the balance was on the right side of the ledger to meet fixed charges.

Thus far the locomotive has advanced prominently in weight and capacity, or in other words, brute force. We now have before us the problem of making each ton of weight stand for the maximum possible horse-power, and in this there is much to be done. It will never be possible to improve the locomotive to a point in which it will compare favorably with the best marine and stationary practice with regard to the number of pounds of coal per indicated horse-power per hour; but in the line of its present standing, as a machine which must run on the road and be relatively inexpensive to maintain, much may yet be done in increased economy in the use of steam.

Among progressive methods which should be considered prominently at this convention is the necessity for improved facilities for quickly turning engines at terminals. Until recently it was thought that anything in the form of a roundhouse would suffice, but now passenger engines are expected to make 100,000 miles, and freight engines from 40,000 to 50,000 miles per year. Roundhouses need more attention than was formerly given to shops, and this is brought about for the best of business reasons. There is scarcely any direction, except perhaps in economies in fuel, in which our work will bring more immediate and satisfactory returns than in prompt work at terminals. In busy times terminal conveniences are more readily needed and appreciated, because idle machinery for road service is shown to be so prominently unproductive, from the fact that the quicker and better the roundhouse works the smaller will be the number of engines required.

The exact relative costs of fast and slow trains is difficult to ascertain; but this subject in itself is to my mind less important than another suggested by it, viz.: The advantage of high average speed—including time lost in stops—in other words, what is the cost of the needless delays on the road which render it necessary to run unduly fast between stations? Most trains stop unnecessarily long at stations. They must sometimes wait six, eight or even more minutes for water to run into the tender tanks through a small pipe, where one or two minutes is long enough where pipes are sufficiently large for the delivery of the water. Trains are slacked up for dangerous places which would be passed at high speeds if equipped with signals.

The motive power department is glad to do its part, but the growing severity of modern conditions demands the co-operation of all who have to do with train service in reducing wasted time. It is difficult to realize that a minute lost at a station is the same as one lost while running, yet that is the fact, and delays at stations necessitate faster running as a matter of course, and consequently a relatively higher cost is invited in operation.

In closing I would like to remind you that the remarkable changes in the ownership and control of some of our largest roads must be taken to indicate most important alterations in the situation in which we are a part, and it behooves us to watch lest we fail in some degree to appreciate what it means to the departments which we represent, and with renewed efforts we must meet the new problems in a way that will inspire confidence and insure absolute progress.

Reports of the Secretary and Treasurer indicated a satisfactory condition as to membership and finances. The total membership is 665. The balance in the treasury is $3,712.90, with all bills paid.

Messrs. Henry A. Sprague, Reuben Wells, D. O. Shaver, Wm. Swanston, J. H. Setchel, J. M. Boon, John Hewitt, W. H. Lewis, W. A. Foster, Allan Cook, J. M. Scheer and L. B. Paxon were elected to honorary membership. The names of Messrs. F. W. Lane, of the "Railway Age," and John Player, of the Brooks Locomotive Works, were presented for letter ballot for associate membership.

DISCUSSION OF COMMITTEE REPORTS.

Relative Merits of Cast Iron and Steel Tired Wheels.

This report offered no recommendations and was evidently a disappointment. Mr. Sanderson presented a discussion of the cost side of the comparison of steel tired and cast-iron wheels. He assumed the cost of a steel-tired wheel at $45 and that of a cast wheel at $8, the relative mileages under 100,000 lbs. capacity cars being as 300,000 to 50,000. The average daily mileage under coal cars was 45 and 10 pairs of each kind of wheel were taken. The comparison on corresponding mileage of 1,000 miles for both showed a cost of 35.174 cents for steel-tired wheels as against 19.684 cents for cast iron. The question is whether the increased cost of steel-tired wheels was justified. It was apparent that it would pay to use the best

quality of steel wheels in comparison with cheaper ones. Mr. Mitchell believed the cast-iron wheel should have the advantage of greater life due to the use of better material at a greater cost. Mr. Leeds did not believe it possible to obtain a mileage of 300,000 from steel-tired wheels with the present type of trucks. He insisted, however, that cost was subordinate to safety.

Report on Ton-Mile Statistics.

The committee made no report and recommended that the matter be dropped. Mr. Quereau, of the committee, discussed the subject individually and presented the argument favoring the inclusion of the weight of the engine in that of the train, which was contained in his article in our June number. He was, however, opposed to the comparison of statistics because of the fact that conditions vary so greatly with regard to grades, quality of water, weight and speed of trains as to render it impossible to compare performances fairly. It was legitimate to compare the work of one division with itself for different periods of time. He suggested the desirability of placing the association on record to the effect that making strict comparisons of the statistics of various roads with varying conditions was not conducive to best results. This was put into the form of a resolution and was carried. Mr. Delano was sure that comparisons would continue to be made, although the unfairness was recognized. He thought that it was worth while to work toward an improvement of the methods of preparing statistics and was sorry to see the association go on record in this way. Mr. Quereau offered an additional resolution to the effect that it was the opinion of the association that the ton-mileage figures should include those of the engines and tenders as a credit to the motive power department. Mr. Leeds supported Mr. Quereau in an excellent argument. The second resolution was unanimously carried. The committee was continued to confer with the statistical associations and report next year.

Topical Discussions.

The Proper Method of Lubricating Locomotive Driving and Truck Axles.—Mr. G. R. Henderson opened this subject with a severe arraignment of present methods of lubricating locomotive journals which were about as bad as they could possibly be. The conditions were very severe and the difficulties great. The criticism seemed to us to indicate the desirability of forced lubrication. Mr. Symington and Mr. Rhodes favored precautions to keep dust out of the oil holes by the use of plugs.

Should Parallel Rods be in Position on Locomotives While in Transit?—Mr. Garstang opened this question by advocating the shipment of locomotives from the builder's works with these rods in place, because of convenience and also because it insured good fitting by the builders. The engineering departments objected to the absence of the rods on account of the destructive effects of the counterbalance under such conditions. A resolution was passed to the effect that the members should require the builders to deliver engines with the side rods in place.

A Classification of Locomotives.

Mr. Sanderson read his paper by abstract. It was apparent that the large number of wheel arrangements necessitated some logical system of classifying locomotives. Mr. F. F. Gaines referred to his article in the American Engineer for April, 1901, for his idea of what a classification should include. Mr. Leeds preferred the simplest possible method and would number the locomotives in classes representing the various class characteristics by the numbers. Mr. Sanderson's system was criticised because it was necessary to remember the meaning of the reference letters. Mr. Fowler argued in favor of Whyte's classification as a logical system of designating locomotives which would be understood everywhere in general reference to the wheel arrangement. Mr. Fowler offered a resolution to the effect that Mr. Whyte's classification should be endorsed by the Association. Mr. Leeds supported the resolution on the basis of the convenience of being able to intelligently indicate the types of engines in correspondence if not otherwise valuable. The resolution was amended and the subject referred to the committee on subjects for report next year.

Cost of Running Trains at High Speed.

The difficulty in securing satisfactory data on this subject was well understood. Mr. Rhodes considered it important to know in the definite terms of the report the cost of high-speed trains. It might have the effect of checking the tendency toward faster trains. Mr. Whyte criticised the statement made by the committee that the coal consumption increases directly as the speed. This was not borne out by an analysis based on the increase of train resistance as the speed increases. Mr. Delano, whose contribution to the report we print almost in full, explained the tests made on the C., B. & Q. R. R. They were not offered as establishing a curve but as showing a tendency in regard to fuel consumption. While the tests indicated what would be expected, an increase in fuel consumption with the speed, in the discussion we think it should have been made clear that there are other questions as important as that of the fuel. The speeds of freight trains were not touched upon. Mr. Delano did not wish to be understood as objecting to increasing speed. He thought it important to know the relation between the cost and speed. There was much more to be done for the benefit of railroad managements. The committee was continued for further investigation.

The Most Satisfactory Method of Handling, Cleaning and Setting Boiler Tubes.

Mr. Rosing in presenting the report indicated a number of ways in which labor might be saved by better use of pneumatic tools. Mr. David Brown had found it desirable to apply safe ends one gage thicker than the tubes. He preferred oil furnaces for tube work because of saving the delays due to cleaning coal or coke fires. Prof. Hibbard referred to foreign practice in stretching steel tubes instead of applying safe ends. He thought it worth trying. The discussion brought out the advantages of steel tubes which were not presented in the report. Mr. Quereau reported very satisfactory experience in welding steel tubes with water glass as a flux. He considered this a satisfactory solution of the difficulty, if it was really a difficulty. Mr. A. E. Mitchell said that there was no difficulty in welding iron safe ends on steel tubes made by the Shelby Steel Tube Company. Mr. Garstang stated that he had no difficulty in welding steel safe ends to steel tubes. There was no testimony in the discussion that was in any way unfavorable to steel tubes. Mr. Rhodes spoke of the pitting of tubes which was usually due to acid in the water. He thought it would affect steel and iron alike. Mr. John Platt testified to satisfactory experience with steel tubes in English naval service, providing the material was good. Steel was, however, uncertain with regard to pitting, particularly in marine practice where distilled water was used. Mr. Symington called attention to the importance of water purification. There was no trouble in good water districts. It was evident that tube practice was backward. Exigencies of present service had caused a difficulty which was both serious and general.

What Is the Most Promising Direction in Which to Effect a Reduction in Locomotive Fuel Consumption?

Mr. Rhodes believed this to be a most important report. Fuel consumption could be reduced by many different improvements systematically followed up as is done in the matter of oil consumption by the Galena Oil Company, by stopping the waste. Mr. Rhodes advocated the employment of a specialist to improve the use of fuel on each road. Mr. Charles M. Muchnic presented interesting information concerning French practice in compound locomotives, showing the value of the four-cylinder balanced type of Mr. de Glenn, of which many are in use in Europe. It was evident from the discussion that there is to-day more intense interest than ever before in efforts to improve the economy of the locomotive. "Eternal vigilance," Mr. Humphrey said, "was the secret of success in this direction. Much may be accomplished by interesting the men, by per-

fectly fair fuel records and by education." The compound locomotive received substantial endorsement.

Feed-water heaters received prominent attention, especially in Mr. Forney's remarks. He outlined the advantages and also the difficulties connected with the problem. Professor Goss, among other good points, mentioned the effect of clearance. The steam admitted to the clearance space was not lost as it returned work to the piston on the next stroke. He considered the steam leaks from valves and fittings about locomotive boilers too important to be neglected, because of the large losses they represent.

A Practical Tonnage Rating.

Mr. Henderson's paper on this subject was very well received. We shall print it nearly in full next month. Mr. Quereau supported the author in believing that theoretical ratings would save much time in establishing practical operating ratings. In other words, office work will assist in securing the necessary data from the road. Mr. Seley considered it advisable to give to large capacity cars the advantage of the fact that their resistance per ton is less than that of lighter cars instead of increasing the rating of engines handling such cars. The discussion developed the fact that there was a question as to the relative resistances of empty and loaded cars.

Maximum Monthly Mileage Practicable and Desirable to Make.

This report recommended single and double crewing and the use of extra men in place of pooling. The discussion centered in the question of crewing. Mr. Rhodes showed that pooling permitted the selection of engines with reference to particular trains to be hauled without interfering with the runs of the men. Mr. Deems strongly endorsed pooling. When carefully arranged it was altogether satisfactory and greatly increased mileage. Mr. Quereau also supported pooling. In fact it was ably defended. It permitted an even distribution of pay and an even distribution of rest. In the discussion nothing was said that was adverse to pooling. This system had gained strength during the past year.

The Most Improved Method of Handling Locomotive Coal Prior to Unloading on the Tanks.

Mr. Rhodes spoke approvingly of the tendency toward placing the chief coaling stations convenient for engines on the main line and would provide only for switch engines at the roundhouses. It was evident that the Association approved of generous expenditure for equipment for handling coal. Mr. Waitt quoted costs for handling coal on the New York Central varying from 1.4 cents to 41 cents per ton according to the conditions. Where there was sufficient room he approved of the inclined trestle and simple coal chute not requiring machinery or shoveling. The cost by these was as low as 1 cent per ton. Where there was insufficient room conveyors were necessary. They were also necessary in case bituminous and anthracite coal were mixed before using. Mr. Delano mentioned satisfactory experience with track scales for weighing the tenders in order to secure accurate measurements of the coal.

Index of Proceedings.

The committee reported the completion of the index in a volume of 200 pages which would soon be ready for distribution. Upon this achievement the Association is to be congratulated.

An "Up-to-Date" Roundhouse.

It was made apparent by Mr. Rhodes that roundhouses should be better lighted in the daytime and a high or peak roof with skylights not only favored lighting but was an improvement as regards drainage, and while it costs more it was preferred to the flat roof. Special stress was placed upon the necessity for the best possible ventilation. The discussion was general and covered many details, it occupied more time than was given to any other subject treated at the convention and also called out the largest number of speakers, thus indicating appreciation of the importance of the best roundhouse equipment. The committee was continued.

After the election of the following officers the convention adjourned:

President, A. M. Waitt; First Vice-President, J. N. Barr; Second Vice-President, G. W. West; Third Vice-President, F. A. Delano; Treasurer, Angus Sinclair; Secretary, Jos. W. Taylor.

MASTER CAR BUILDERS' ASSOCIATION.

THIRTY-FIFTH ANNUAL CONVENTION.

Saratoga, N. Y., June, 1901.

This convention opened June 24, President Chamberlain presiding. Following the invocation by the Rev. Delos Jump and the address of welcome by President A. P. Knapp of the Village of Saratoga, with response by Mr. A. M. Waitt, the annual presidential address was read by Mr. Chamberlain. This was devoted principally to comments upon the reports of committees for the convention and the progress in the development of car construction. The secretary's report showed the total membership to be 483, a gain of 20 during the past year. The balance in the treasury, as stated by the Treasurer, Mr. Kirby, was $9,590.48. The routine business of the convention was despatched promptly and the revision of the rules of interchange was taken up early in the opening session. The time devoted to it was less than two hours. Last year there were but 31 cases brought before the arbitration committee, an indication that the rules are working admirably. The important change this year was in the prices of cleaning triple valves and brake cylinders. It has been a rule that all M. C. B. prices should not be such as to permit of making a profit by repairs, but an exception was made in this case in order to put a premium upon the proper condition of these vital parts of the brake apparatus. The new prices are 20 cents for thoroughly cleaning a triple and the same amount for a brake cylinder. These prices are slightly above the actual cost under normal conditions and it is probable that more triples will be cleaned if even a few cents profit may be made on each one. This action is likely to have an important effect upon the condition of air brakes, to which Mr. G. W. Rhodes called attention in his article in our June number. The other changes in the rules were of less importance and were disposed of quickly.

DISCUSSION OF COMMITTEE REPORTS.

Triple Valve Tests.

Mr. Rhodes explained the tests on the Hibbard valve and laid special stress upon sensitiveness, as indicated by the disc tests, which showed that the Hibbard valve had not been designed with a complete understanding of the importance of the time requirements. In long trains the rapidity of application in the rear cars was important, because of its effect upon the shocks of application. It was apparent that the work of the committee was most thoroughly done.

Laboratory Tests of Brake Shoes.

Mr. Bush opened this subject with an explanation of the origin of the test shoes, two of which, the Lappin and Cardwell shoes, were not received from railroads and were not to be considered on the same basis as the others. They were softer shoes and not those regularly furnished to railroads by these manufacturers. The committee recommended an increase of speed for tests of shoes on steel wheels to 65 miles per hour, as being nearer present passenger service conditions. Mr. Sanderson made a distinction between friction and tire dressing. The shoe which would dress tires would naturally have the longest life. A happy medium between high friction and long life of the shoes was desired. More efficient shoes were desirable for steel wheels because they were used in passenger service. The tendency was toward a sacrifice of efficiency in order to secure long life. This being now fully understood, a change toward greater efficiency was suggested. Mr. Rhodes was afraid that the importance of the fact that brake shoes were intended to stop trains would be somewhat neglected in the desire to secure durability of brake shoes. This was the chief feature of the discussion.

The specifications submitted by the committee were modified by dividing the shoes into two groups, one for chilled wheels and one for steel wheels, increasing the speed of tests for steel wheels. They were referred to letter ballot as a standard.

"M. C. B." Couplers.

Mr. Atterbury, in introducing the report urged the members to use the worn coupler gage. There was a strong demand for a reinforcement of strength by increasing the size of coupler shanks. An increase of 76 per cent. in strength was suggested, by enlarging the shanks to a section 5 by 7 ins. Changes in the head were also proposed; they strengthen it but do not affect the contour. Changes in the present unsatisfactory test of knuckles, and also the jerk test were suggested, to the effect that dummy couplers should be used in both of these tests in order to reproduce the conditions of service. The committee also proposed a design that would make the yoke correspond in strength with the new shank. Mr. Sanderson, who had given special attention to the breakage of couplers, presented an able argument in favor of pivoting the coupler head in order to reduce the stresses of the couplers due to curving. Present construction did not provide sufficient side play. This resulted in straining trucks, platforms, causing rail wear, flange wear and incurring danger of derailment, with frequent fracture of the weakest parts. This was received with evident approval of the association and was considered an important subject for investigation by the coupler committee. Mr. Sanderson was supported by Mr. Schroyer, who had made tests showing that under severe conditions, with cars having long, overhanging ends, the stresses sometimes amounted to 57,000 lbs. Mr. Atterbury supported Mr. Sanderson in the opinion that swiveling the coupler should be considered. It was also desirable to increase the strength of couplers, through the knuckle pin hole. This might be made unnecessary by the swivel if the contours will not permit of the necessary reinforcement. The recommendations as to specifications were ordered submitted to letter ballot.

Supervision of Standards and Recommended Practice.

This report covered a number of minor details, among which changes were suggested in the standard journal boxes to prevent the journal bearings from breaking out the rear walls. Mr. Whyte showed the necessity of this in our issue of September, 1900. The recommendations were ordered submitted to letter ballot. Mr. Rhodes spoke of round bottom journal boxes, believing that the round bottomed box was not good because of the tendency of the waste to move and cause "waste grab," a source of considerable trouble.

Revision of Recommended Practice in Springs for 100,000-Pound Cars.

This committee had gone to the trouble of having sample springs tested to insure the satisfactory operation of those recommended in the report. The report also favored abundance of steel in springs. It was ordered submitted to letter ballot.

Cast Iron Wheels.

Mr. Barr considered it undesirable to permit wheel makers to use so large a proportion of old wheels in the manufacture of new wheels. This, moreover, was accompanied by the use of inferior new metal which rendered the cast iron wheel situation a serious one. Mr. Garstang read a minority report because he did not agree with the changes suggested in the report. He did not approve of light wheels, and would prefer increasing the weights. A number of speakers supported this view. The tendency to increase loads was thought to demand heavier wheels. Mr. Garstang recognized the inferiority of wheel metal and thought that "two pounds of poor metal were better than one pound." Mr. Hennessey made an eloquent appeal for better material. If wheels burst in forcing axles in place the remedy was better metal rather than more metal. Others admitted the use of poor iron, but believed it necessary to use more weight for safety under present conditions. Mr. Stark mentioned flange failures. This he considered the real question of the time. The committee was continued and instructed to report the subject of design, material and form of wheels of 60,000, 80,000 and 100,000-lb. cars, a most important piece of work.

Uniform Section of Siding and Flooring.

This committee directed its efforts toward the selection of sizes of lumber for these purposes, whereby the best possible advantage could be had in the purchase of lumber. After discussing some of the details, the recommendations were ordered submitted to letter ballot.

Air Brake Hose Specifications.

Mr. Sanderson spoke of the damage at the ends of air brake hose and believed it important to furnish reinforcement by nipple caps at the ends. The committee agreed that a very large proportion of the damage to air hose occurred at the ends because of the treatment required in forcing the couplings into place. The nipple cap prevented this. The report was submitted to letter ballot.

Chemical Composition of All-Steel Axles.

The report stood for a retention of the present proportion of carbon instead of a reduction, as was desired by some members. Mr. Gibbs supported the high carbon, and related unsatisfactory experience with the earliest steel axles imported from England. They were very soft and gave much trouble. He thought the present specifications as to fiber stress were fully high enough and would insure sufficient wear. He had not found any difficulty in cooling hot journals with water, and thought that this fear was not well founded, as far as high-carbon axles were concerned. Mr. Albert L. Colby, of the Bethlehem Steel Company, was invited to address the convention. From the standpoint of the metallurgical engineer he supported the present carbon requirement. It insured the qualities needed to withstand "fatigue." He did not approve of specifying the proportion of silicon. A large number of axles would be found to have more than 0.05 silicon, the present requirement. The phosphorus and sulphur should be limited, and the manganese and silicon should be left to the manufacturer. It should be clearly stated that axles should be made by the open-hearth process. Copper in small proportions was not detrimental, and should not be mentioned in the specifications. He would like to see all unnecessary limitations stricken out of the requirements. No arguments were presented in favor of reducing the carbon. The committee recommended several changes in the dimensions of the standard axles and a new classification of the axles. These were referred to letter ballot.

Rules for Loading Long Materials.

This committee had carefully revised these rules and assembled the general instructions, avoiding repetitions. It was recommended that two separate committees be appointed to formulate rules applying to box cars and to further consider the subject of safety chains with reference to flat and gondola cars. The revised rules, except section 27, referring to safety chains, were submitted to letter ballot. To the work outlined for the new committees was added the consideration of the weight of lap lumber shipments for the benefit of the Southern lumber lines.

Index of Proceedings.

The probable cost of the index was placed at about $1,500. It was ordered that the work should be done, to include all of the proceedings to date.

Draft Gear.

This subject was continued with the addition of two members to the committee, with the understanding that tests shall be made. Mr. Sanderson suggested the design and construction of an improved machine for drop tests. Road tests were, however, necessary in order to determine the effect of recoil. Mr. Hennessey voiced the opinion of many to the effect that the present situation in draft gear is an emergency. It was definitely stated that continuous-draft gear was necessary and that the requirements were past the possibility of wooden sills; also that the center line of draft should be well within the vertical dimensions of the center sills, in order to prevent destructive bell-crank action. Mr. Quereau thought that the proportion of 75 per cent. of the cost of repairs of cars, due to

the draft gear, could be reduced to 25 per cent. by the use of a continuous-draft gear used in connection with buffer blocks. Mr. Clark described the draft gear illustrated on page 370 of our issue of December, 1900. This design brought the center line of draft at the lower face of the center sills, and by turning the end sill on its side the draft was brought nearly where it should be without cutting the end sills. Mr. Rhodes believed that the committee should take the initiative by outlining tests. Mr. Canfield spoke of the large amount of equipment now in service which required improvement, and this could not be done by changing the height of floors. Longer draft timbers extending beyond the bolsters were necessary. Several speakers thought it advisable to urge the transportation officers to insist on more considerate handling of cars. Formerly merely draft rigging was broken in the yards; now ends of cars are torn out entire because of rough treatment. Mr. Brazier stated that the New York Central was obliged to replace 3,000 couplers and 1,500 knuckles per month. The association, for some reason, failed to open the great question in the subject, viz., the necessity for increased capacity because of the increased capacity of locomotives and cars. The principles of draft gear, except that of "continuous" gear, were not presented. The committee was continued as stated.

Topical Discussions.

Mr. Rhodes presented an able argument in favor of greater care in the selection of car inspectors.

The practice of rolling or burnishing journals was adversely criticised by Messrs. Canfield and Brazier. The roller was used to press down the roughness left by the lathe tool, leaving it smooth. If in the first trip of the car the axle turned in the direction in which its axle turned while being rolled, all was well; but if it turned in the opposite direction the fibers were raised, and heating commenced. Mr. Hennessey's experience was, however, entirely favorable to the rolling process.

Mr. Pfieger, of the Pullman Company, exhibited a splice in a car sill which had been in use under a Pullman car for nineteen years. It was a convincing argument in favor of splicing sills in passenger-car construction. Splicing permitted the use of the best timber because of the difficulty in securing satisfactory timber of sufficient length for continuous sills. The practice of splicing sills was generally indorsed by several speakers, with no adverse criticism. This subject was referred to a committee for report next year.

Election of Officers.

President, J. J. Hennessey; First Vice-President, J. W. Marden; Second Vice-President, F. W. Brazier; Third Vice-President, W. P. Appleyard; Executive Committee, T. W. Demarest, W. Renshaw, J. T. Chamberlain; Treasurer, J. Kirby; Secretary, J. W. Taylor.

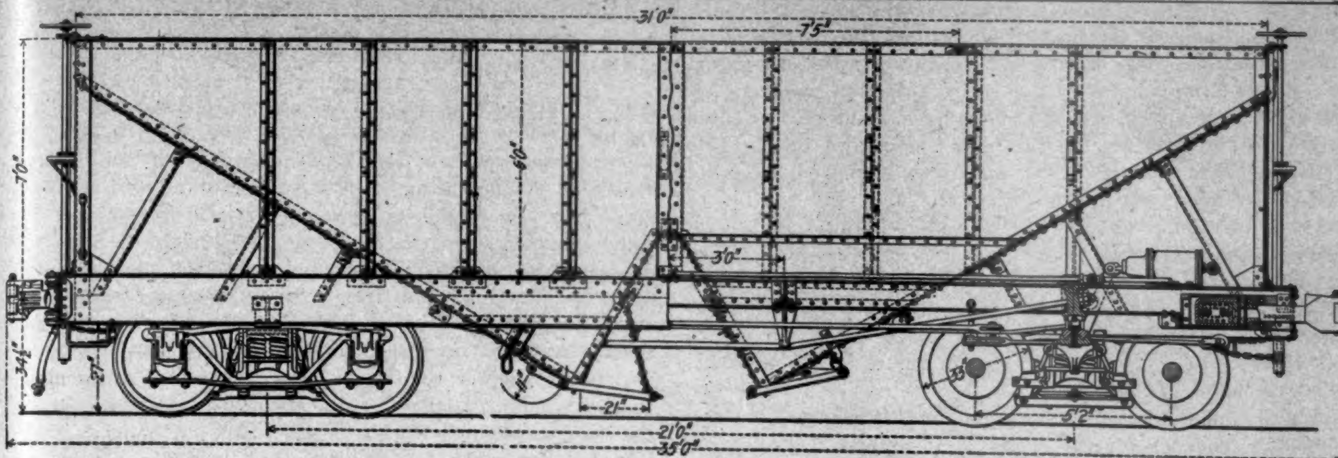
Stationary engine practice has reached a high stage in the 8,000 h.p. Allis units for the Manhattan Railway of New York. The builders guarantee that the amount which a point on the circumference of the armature will lag behind the point of uniform rotation, plus the amount which it forges ahead of that point shall not exceed three-fifths of one degree of the circumference. This uniformity will be a result of the cylinder arrangement whereby the shaft will receive eight impulses per revolution. The speed of a point in the circumference of the armature, running at 75 revolutions per minute will be 1.4 miles per minute. The crank pins of these interesting engines are 18 by 18 in., and the main journals are 34 in. in diameter by 60 in. long. An economy of 13 lbs. of dry steam per indicated horse-power per hour is guaranteed. The engines occupy 2,000 sq. ft. of floor space and stand 38.3 ft. high above the floor level. Eight of these units were provided for in the original installation and the number will be increased to twelve. They are the largest stationary engines ever built. These and other details of the construction are noted in the June issue of "Power."

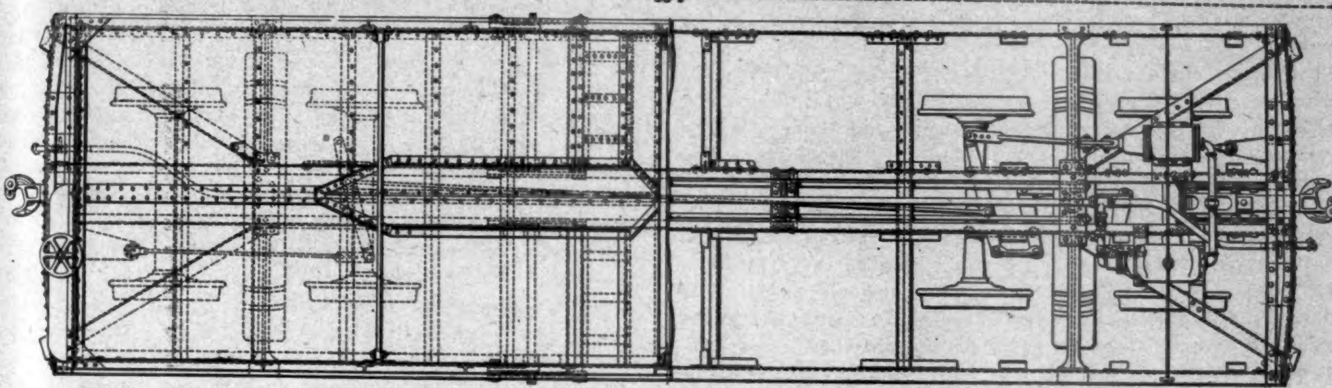
THE NEW PENNSYLVANIA RAILROAD STANDARD PULLMAN PARLOR CAR.

New Pullman Parlor Cars are now being placed in the service of the Pennsylvania Railroad between Philadelphia and New York. They have been constructed upon designs furnished by the Pennsylvania Railroad officials, and will be known as the Pennsylvania Standard Pullman Parlor Car. The cars are 70 ft. long, and their exterior presents the well-known Pennsylvania Railroad color—Tuscan red, with gold trimmings. They have wide vestibules. The interior is finished in highly burnished light mahogany, decorated in marquetry. The main windows are very wide; they are protected by shades, and the absence of any drapery about the windows or in the interior is a noticeable improvement. The upper deck of the roof is very wide, thus giving a significant appearance of unusual size to the interior and at the same time aiding materially in the ventilation. Thirty handsomely, yet comfortably, upholstered armchairs supply the seating accommodations. Lady travelers will appreciate the enlarged provision for their comfort in the addition of a dressing room fitted with mirrors and toilet requisites, in communication with the usual toilet room. At the other end of the car there are two toilet rooms for men, instead of one, as is usual. The entire decorative scheme of the interior lends a brightness and an effect of roominess to the car, which carries with it a suggestion of coolness in summer days.

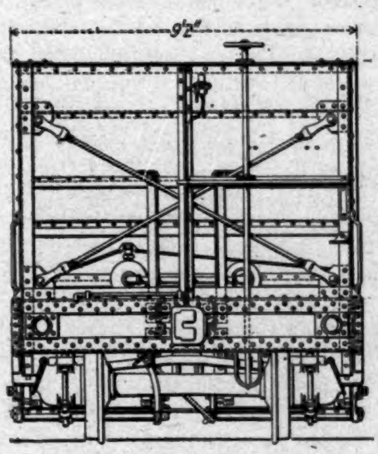
Compressed air has in its comparatively short career sprung into many places of usefulness, not only as a power for operating shop and foundry tools of all descriptions, for construction and building work, but as a motive power. For this purpose it has been used successfully on streets cars in France for a number of years, and in New York and Chicago for the past two years. The United States Government, after some careful investigations and trials of compressed air locomotives, are now using them very successfully for handling ammunition about the larger magazines. Many of the manufacturers of powder use compressed air as a motive power owing to the absence of fire and its entire independence under a charge of air to run at will. Such cars or locomotives are in themselves a complete unit and can be operated as cheaply as with electricity or steam, and cheaper when the cost of special installation and maintenance is considered, for they can run on tracks of any desired gauge.

The amount of moisture in steam generated by a locomotive boiler is probably not as great as is generally believed. Experiments recently described in the American Engineer and Railroad Journal, January, 1901, page 28, indicate that the amount is usually much less than 1.5 per cent., when the locomotive is running under nearly uniform conditions. Readings taken from a calorimeter placed on one of the branch pipes in the smokebox, midway between the saddle and T-head, show less moisture than when read immediately at the steam dome of the boiler. In the latter case the amount of moisture determined from a series of 35 tests made on the boiler of the Purdue Locomotive in 1895 ranged from 0.49 to 1.62 per cent. A series of 19 tests made at an earlier date upon the same boiler operated under more constant conditions, and at lighter power, gave an average of 0.95 per cent. of moisture. These readings were taken from a calorimeter attached to one of the branch pipes. It was found that the steam in passing through the branch pipe absorbs heat from the smokebox and is delivered to the calorimeter about 0.25 of 1 per cent. dryer than at the boiler. This correction added to .95 per cent. makes the average amount of moisture in the steam for this series of tests 1.2 per cent. And this amount would seem to increase very slightly as the rate of evaporation is increased. There are conditions where considerable water passes the throttle with the steam, but this is because the water-level in the boiler is kept too high, or too sudden a demand is made upon the steam, which causes some spray to pass the throttle.

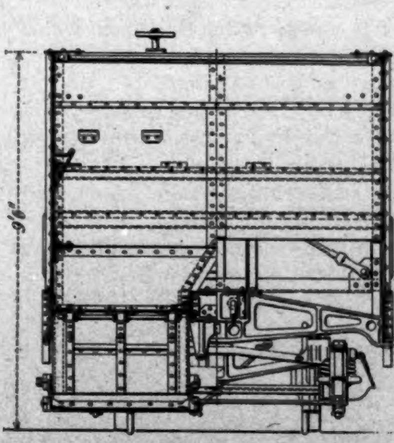




100,000 Pounds Capacity Hopper Cars, with Truss d Center Sills.
The Structural Steel Car Company.



End levation.



Transverse Section.

100,000 POUNDS CAPACITY STEEL HOPPER CARS.

With Trussed Center Sills.

The Structural Steel Car Company.

The specially interesting features of this design are the light weight of the car and the method of construction in which the center sills are made of light sections, reinforced by truss rods. The car is designed to carry a load of 110,000 lbs. with a capacity of 1,825 cu. ft. when filled level with the top flange angles, the estimated weight of the car being 31,400 lbs. Its length inside is 31 ft., length outside 35 ft., width outside 9 ft. 4 ins. and height, from the top of the rail to the top of the flange angles, 9 ft. 6 ins.

The side sills are of 15-in., 33-lb. channels and the center sills are 8-in., 13¾-lb. channels. These channels are trussed with two rods, which are anchored at the centers of the body bolsters, the bolsters being constructed specially to receive them and make the anchorage secure. The body bolsters are of cast-steel, fitting between the side and center sills and bringing the center plates flush with the lower edges of the side sills. The side bearings are designed to carry a part of the load permanently. They consist of radial cones, placed in the truck bolster. The bolster has seats with corresponding angles to run over the cones. The end sills are ½-in. plates, secured and stiffened by reverse angles. The corners of the end and side sills are braced against end and corner shocks by angle braces shown in the plan view. These braces rest on lugs cast upon the body bolsters at the center sills and are riveted through bolsters and sills, thus distributing the shocks and stresses of buffing and pulling to the center and side sills. The lateral bracing is also shown in the plan view. In addition to the body bolsters there are two connections to the center sills, which serve also as seats for the struts of the truss rods and the side sills are braced by four angles at about 5-ft. centers.

The draft gear is carried by the center sills and two angles,

the whole gear being made central with the 15-in. side sills. The arrangement of the brake gear, which differs from usual construction in hopper cars, is clearly shown in the engraving. The sides of the car are supported by T section members secured to the side sills, the side plates being reinforced at these points by plates inside the car body and shown on the side elevation. The floor is carried on angles supported by other angles, arranged perpendicularly to the floor and secured to the side and center sills. There are four of these angle supports at each angle cross bearer and three cross bearers at each end of the car. Three more are placed between and below the sills. The ends are supported by angle corner posts, braced at their lower ends. The corners at the top of the car have each a T center post. The cross bracing at the end is in the form of clevis bars. These effectually tie the corners of the car, making it impossible for it to twist, which is expected to overcome the tendency for the rivets to shear and the side supports to break. Three tie rods extend across the car at the top angles.

The lower central portion of the car is divided into four compartments by the cross and central ridges, which divide the load and cause it to run to the discharging doors, one of which is shown in the open position and the other one closed. The doors may be operated separately or in pairs, as desired, the operating gear being simple and apparently effective. This gear consists of one cross shaft to each pair of doors, the shafts having side crank arms, which engage the side links and one end of each link is fastened to the door angle. The doors are kept closed and fastened by the links attached to the angle supports, as shown in the elevation drawing.

The trucks are of the diamond type with a new design of truck bolster and spring plank. The bolsters and spring planks and also the truss rod struts are of cast steel. In calculating the various stresses about the car a factor of safety of 6 was used and additional 10 per cent. was added for the increased stresses due to vibration.

These cars are to be built by the Structural Steel Car Company, recently incorporated under the laws of Ohio, and large works are now being built at Canton in that state, for the construction of this and other types of steel cars which we expect to illustrate later.

With an estimated weight of 31,400 lbs. and a load of 110,000 lbs. this car has a ratio of 78 per cent. of carrying load, which is the highest ratio which has thus far come to our attention. This car was designed by Mr. W. H. Woodcock, M. E., and Mr. R. H. Hornbrook, Member Inst. M. E., who are interested in the Structural Steel Car Company.

Among the exhibits of progressive railroad improvements at the Saratoga Conventions this year was a display of pneumatic sanders by the American Locomotive Sander Company of Philadelphia. The Leach, Sherburne, Houston, "She," Dean, Curtis and Austin sanders are all owned and manufactured by this company. They are easily applied to old or new sand boxes and can be used in combination with gravity sanders or independently as desired. They will handle sand promptly, economically and are all simple and easily understood. Each of the pneumatic sanders manufactured by this company have their advantages and are all worthy of careful consideration.

The Garry Iron & Steel Roofing Company are manufacturing a variety of pneumatic cranes, jacks and painting machines for a great variety of purposes. Their No. 2 and No. 3 cranes are mounted on hand cars and used for light work in and about railroad yards, and their No. 1 crane is for heavy work, such as unloading car trucks and wreckage. The ease and rapidity with which these cranes can be operated was shown to good advantage by actual demonstration, at Saratoga, during the conventions in June. The crane on exhibition was rigged for handling coal. It was made of channel steel and mounted on a revolving table equipped with a pneumatic brake which is used to stop the crane at any point in its circuit. The Garry Iron & Steel Roofing Company have ready for distribution a finely illustrated catalogue of these machines. Their offices are at Cleveland, O.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

Semi-Annual Convention.

The American Society of Mechanical Engineers held its spring meeting in Milwaukee, Wis., May 28th to 31st. The meeting was very successful, although the discussions were somewhat disappointing. The most important subject was the application of electricity to shop driving, introduced by a comprehensive paper by Professor W. S. Aldrich. The most important feature of the paper and discussion, and also of the paper by Mr. John Ridell on portable machine tools, was to show the value of electric driving in its influence on output. Convenient speed control made it possible to obtain higher capacity of machines, because it led to convenient attainment of the maximum cutting speeds. Professor Aldrich estimates the value of electric driving as increasing output from 30 to 40 per cent. per square foot of floor space, from 20 to 60 per cent. per machine and from 10 to 30 per cent. per man; the reduction in the cost of production being from 25 to 45 per cent.

Superheated steam was a prominent subject, introduced in papers by G. A. Hutchinson and E. H. Foster. These reviewed progress up to date and recorded very successful experience abroad, it was stated, that "A net gain in economy of 10 to 15 per cent. is a common result, while a saving of 20, 25 and even 30 per cent. is by no means uncommon." It was shown that Continental engineers are advanced in the use of superheated steam. Professor Goss thought that American engineers appreciated its possibilities, but up to this time preferred to secure the economies in easier ways. These two papers constitute a valuable record on this subject.

Papers on Drafting Room and Shop Systems by F. O. Ball, Blue Printing by Electric Light by S. L. G. Knox and Rules for a Drawing Office by A. W. Robinson, indicated the importance of the engineering department in the organization of large modern industrial establishments. Drawing-office rules must, of course, vary according to conditions, but there is much in the papers by Messrs. Ball and Robinson that is suggestive to those who find entirely different arrangements necessary. Mr. Knox described a method of making blue prints by electric light and this paper brought out the desirability of being independent of sunlight, although the electric light took much longer for printing. Messrs. Blood, Hunt and Wellman gave accounts of their successful experience with the electric light blue-print apparatus, furnished by the Pittsburg Blue Print Company.

In a paper on the Influence of Titanium on the Properties of Cast Iron and Steel, Mr. J. A. Rossi indicated a possibility that this element may become an important hardener for iron and steel. Mr. C. W. Hunt described a New Connecting Rod End, which was followed by a preliminary report of the committee appointed to codify and standardize the methods of making engine tests. This report is an exhaustive document, including tests of steam, gas and oil engines, giving forms for recording the data and results. This report was followed by that on the Standardizing of Engines and Dynamos, which indicated that the committee has received encouraging support from the builders of engines and dynamos. Of the other papers presented the one most interesting to our readers was entitled The Locomotive Exhibits at the Paris Exposition, by Professor Storm Bull. This is a record of the locomotives with a complete table comparing their dimensions and was illustrated by half-tone and line engravings.

Mr. F. H. Stillman described A Pully Press Valve. Professor Benjamin read a paper on Some Experiments on Ball Bearings, in which he stated that ball bearings should not be designed on a basis of crushing strength of the balls, because they seldom break in this way. Professor C. H. Robinson described Efficiency Tests of a 125-Horse-Power Gas Engine, which is a supplement to his paper on the same subject at the December meeting. This is a complete record and will be valuable for reference. Under the title Protection of Ferric

Structures, Mr. M. P. Wood adds to his valuable contributions to this society an elaborate discussion of paints and varnishes for the protection of iron and steel.

While there were other papers these are believed to be the most important to our readers.

The first electric railroad in Russia was placed in operation this year. It is 13½ miles in length and connects the manufacturing city of Lodz, in Russian Poland, with the neighboring towns of Zgierz and Pabianice. The road is owned by a company of Polish merchants and manufacturers and was built at a cost of $560,000.

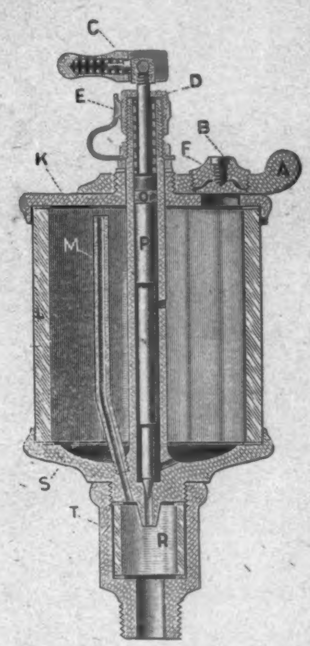
At a meeting of the stockholders of the American Locomotive Company the following directors were elected: Pliny Fisk, George R. Sheldon, S. R. Gallaway, W. Seward Webb, J. E. French, S. L. Schoonmaker, of New York; A. J. Pitkin, Schenectady, N. Y.; Joseph Bryan, Richmond, Va.; F. H. Stevens, Buffalo, N. Y.; Charles Miller, Franklin, Pa.; George W. Hoadley, Providence, R. I. At a meeting held by the directors the following officers were elected: President, S. R. Callaway; Vice-President, A. J. Pitkin; Second Vice-President, R. J. Cross; Secretary, Leigh Best; Treasurer, C. B. Denny; Comptroller, C. R. Patterson. The Executive Committee of the company consists of Pliny Fisk, George R. Sheldon, S. R. Callaway, A. J. Pitkin and J. E. French. Reed, Simpson, Thacher & Barnum are counsel of the company. The general offices of the company are located in the Broard Exchange Building, New York. A certificate has been filed with the Secretary of State of New York announcing an increase in the amount of capital stock from $50,000 to $50,000,000, of which $25,000,000 is to be preferred stock.

There is little doubt but that considerable of the expense of machining in shops can be saved by finishing work in grinding machines, for the cost of turning the work preparatory to grinding is cheapened and the actual cost of grinding is less. This has been proved more conclusively than ever before by the Norton Plain Grinder, manufactured by the Norton Grinding Company. Samples of work ground by this new machine were exhibited at the recent conventions of the Master Mechanics' and Master Car Builders' Associations and attracted considerable attention. The excellent quality of the work and rapidity with which it can be ground is a step in advance of anything that has been acomplished in this line. The machine has entirely new features and is designed to give a great variety of table, work and wheel speeds. It will grind heavier cuts from heavier pieces than has been heretofore possible. Standard car axles are given the usual roughing cut in the lathe and the wheel fits, bearings and dust caps ground complete in one hour. The bearings after being ground are perfect cylinders, with a smooth surface and no high places or spots to be worn off before the bearing will run cool. This company has just issued a desirable catalogue illustrating and describing this machine and those who are interested in the design and construction may procure the pamphlet from the offices of the Norton Grinding Company, Worcester, Mass.

The very general use of the Harrison dust guard manufactured by the Harrison Dust Guard Company, of Toledo, O., is due to the fact that it completely closes the back of the oil boxes and will stand the severest service. In the construction of the three sections of which these guards are made, the toughest kind of wood is used and the leather packing ring is made of heavy belting leather. The sections are held together by steel rods with coiled brass springs and lock nuts on the spring bolts. The improved form of this guard has the springs in the lower half of the guard, where they are better protected from sand and dirt, and instead of counter-boring the wedge strip which closes the top of the box above the guard, it is simply a symmetrical piece of wood. The durability of the Harrison guard has won for it great favor among railroad mechanics, and that it is appreciated as a thoroughly reliable guard is shown by the greatly increasing orders in the past three months for the improved form.

LUNKENHEIMER SIGHT-FEED LUBRICATOR.

The improved form of lubricator shown in the accompanying engraving is known as the "Paragon" glass body sight-feed lubricator and is used for gas, gasoline or oil engines. Referring to the sectional view of this lubricator, it will be seen that the filling arrangement consists of a slide filler, the slide A screwing down upon and around the lid or cup and has a loose plug which covers the filling hole when the slide is swung over to a closed position. This loose plug is so arranged that the wear can be adjusted by turning down the screw B. The whole construction is very heavy, and the slide can be depended upon to seat perfectly and remain tight for an indefinite period. The feed regulating mechanism may be put on or off by raising



Improved Sight-Feed Lubricator.

or lowering the cam lever C. The rate of feed may be adjusted by turning the nut D, which is prevented from loosening by a spring E. This arrangement of feed may be set and turned on or off without disturbing the rate of flow. The cup is thoroughly packed both around the stem and at the top and bottom of the body and sight-feed glasses, and cannot become leaky. The parts of the cup are fastened together by the Lunkenheimer patent lock nut, which makes it impossible for the cup to jar apart, due to the shaking of the engine, and also dispenses with the annoyance of oil leaks. The construction of the lubricator is very compact and the general design such as to appeal to the users of this class of lubricator.

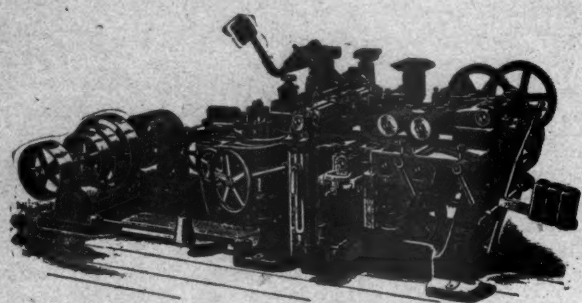
The exhibit of the Safety Car Heating & Lighting Company at the Saratoga conventions is specially worthy of notice and commendation. It was in the form of a section of a sleeping car, the woodwork in white and the upholstery and head lining in green. These colors harmonized with the gold of the lamp fixtures and the brilliant effect of the Pintsch gas and electric lights completed the artistic and tasteful combination.

The fact that the old plant of the New York Blower Company at Louisville, O., has been offered for sale has led to an erroneous report, to the effect that the company is out of business. This wrong impression grew out of a change that was made some time ago in the location of their factory. It was formerly at Louisville, but for the very urgent need of a much enlarged plant and better shipping facilities the company moved to Bucyrus, O., where a new model factory building had been erected. As all the manufacturing is now done at the latter place, the old Louisville buildings have been placed on the market. The New York Blower Company also has offices in New York, Boston and Chicago.

NEW MOLDING MACHINE.

The accompanying engraving illustrates a 9-in. standard molder, No. 14, manufactured by the J. A. Fay & Egan Company, Cincinnati. This new style of machine has many superior advantages over the older style, and will do more and better work. The few following special features will recommend it as a very efficient and high-grade machine.

(1.) In this machine the lower head cuts first. (2.) The table at the feeding-in end is independently adjustable. (3.) The upper feed rolls are driven downward. (4.) All pressure bars can be instantly thrown back, giving free access to the heads. (5.) The main head has outside bearings. (6.) For setting or sharpening the knives the lower head, with its bear-



The J. A. Fay & Egan 9-Inch Molder.

ings, draws out endwise. (7.) There is a countershaft at the feeding-out end of the machine, and there is, consequently, no rubbing or cutting of belts. The J. A. Fay & Egan Company have their offices at 409 to 429 West Front Street, Cincinnati, O., and they will be pleased to furnish prices and full particulars on application.

THE SARGENT COUPLING.

The accompanying engravings illustrate an improved form of the Sargent coupling which is adapted both for pushing and pulling cars on sharp curves, especially where solid knuckles are used. It will be seen that the coupler consists of two open-hearth cast-steel dogs which engage the knuckle arms of the two coupler heads. A strong yet flexible connection is made between these dogs by means of two castings, which are curved to follow the contour lines of the M. C. B. knuckle, and are joined in the center by a pin. In operation the dogs are placed on each drawbar, just back of the knuckle pin, and the curved arms brought together around the face of

The Sargent Coupling.

each knuckle and connected. This connection permits the cars to be pushed or pulled around any curve without injury to the draft gear, and is so spaced that even on the sharpest curves from 6 to 8 ins. is allowed between the end sills of the cars.

The Philadelphia & Reading Railroad has placed an order with the Pressed Steel Car Company for 1,000 low side gondola cars and 100 flat cars, to be built entirely of steel. The gondola cars will be of 110,000 lbs. capacity, similar to the low side gondola cars already built for this road. They will be 35 ft. 10½ ins. long over end sills; 34 ft. long inside of body; 9 ft. 11⅝ ins. wide over side stakes; 9 ft. 4 ins. wide inside of body; 5 ft. 3¼ ins. high from top of rail to top of body; 1 ft. 1 in. deep from floor to top of sides. The cars will be equipped with Fox pressed steel pedestal truck frames, cast-iron chilled wheels, open-hearth steel axles, Westinghouse air-brakes, pressed steel brake beams, and Chicago M. C. B. automatic couplers. The flat cars will be of 110,000 lbs. capacity and will have steel floors. They will be 35 ft. 6 ins. long over end sills; 9 ft. 6 ins. wide over side sills; 10 ft. 1¾ ins. wide over side stakes; 3 ft. 6¼ ins. high from top of rail to floor. They will be equipped with Fox pressed steel trucks; cast-iron chilled wheels, open-hearth steel axles, Westinghouse air-brakes, pressed steel brake beams and Chicago M. C. B. couplers.

The Chicago & Alton has ordered 400 steel cars from the Pressed Steel Car Company. One hundred and fifty of these will be hopped bottom gondola cars of 100,000 lbs. capacity, similar to those built for the Erie. They will weigh 35,514 lbs. and will be 31 ft. 6 ins. long over all; 30 ft. ¼ in. long inside; 10 ft. wide over all; 9 ft. 6 ins. wide inside; sides 10 ft. high above rail. The other 250 will be flat bottom gondola cars similar to the 600 cars already built for this road. They will be of 100,000 lbs. marked capacity and will weigh 35,600 lbs. They will be 43 ft. 3 ins. long over end sills; 41 ft. 9 ins. long inside; 10 ft. wide over side stakes; 9 ft. 4⅞ ins. wide inside; 7 ft. 8¼ ins. high from top of rail to top of body. All the cars will be equipped with gray iron journal boxes; P. R. R. draft rigging; M. C. B. journal bearings, and Schoen trucks.

An inspection of the Webb C. Ball Company's exhibit of watches at the Saratoga conventions this year revealed many special features of the Ball official standard railroad watch. The aim of the manufacturer has been to make a watch that will satisfactorily stand the rough usage of railroad men and be always reliable. It is small and very compact, being about two-thirds the thickness of an ordinary watch. The dial is made exceptionally white and marked in plain Arabic figures. The shape of the crystal and dial is such that the time can be read easily when held even at a very acute angle to the eye. The address of the Webb C. Ball Company is Cleveland, Ohio.

A very interesting line of valves were exhibited by the Homestead Valve Manufacturing Company of Pittsburgh at the recent conventions in Saratoga. Besides the initial Homestead straightway valve containing an internal locking device which marks the success of all Homestead plug valves, there was a more recent form of the original valve. There were also exhibited three-way and four-way valves, the "Homestead Junior," valve, an hydraulic valve for working cranes, presses or furnace doors, and a valve consisting of a simple cock body and a plug. In the last-named valve the plug is held in the seat in mid-open position by a spring at the bottom. In the full open and full-closed positions this valve locks the plug automatically by the addition of locking dogs or projections fastened on the lower end of the plug which effects a tight seating every time the cock is opened or closed. The Homestead valves are almost entirely of metal and have the superior advantage in that the working pressure never touches the seat but passes directly through the port.

The spiral journal bearing manufactured by the St. Louis Car Company is so constructed that that part of the bearing which does not come in contact with the journal is made of malleable iron and in the part that is abraded the best bronze bearing metal is used. This reduces the cost of the bearing without detriment to its service. The construction of the bearing is simple and practical. The bronze lining is keyed into the malleable iron back in such a manner that it can not become loose or detached while in service and is of sufficient thickness to allow the bearing to wear down very thin. This spiral journal bearing is becoming very generally introduced in this country and the manufacturers state that they have added to their works a thoroughly equipped brass foundry, babbitt metal furnaces and machine shop, and they are prepared to furnish these bearings on a large scale. These bearings were exhibited at the recent conventions in Saratoga.

The Brill Semi-Convertible Car.

Interior View of Semi-Convertible Car.

SEMI-CONVERTIBLE CAR FOR SUBURBAN SERVICE.

J. G. Brill Company, Philadelphia.

The car shown in the accompanying engravings was designed to meet the needs of high-speed suburban service both for trolley and steam roads, and has been in use for several years on high-speed electric railways. Aside from the convertible feature of the car it is particularly noteworthy on account of its lightness and strength. This should appeal to the motive-power men of steam railways who have been obliged to increase the weight of their engines in order to pull the much too heavy suburban rolling stock.

The chief object of this semi-convertible type is a satisfactory closed car in winter and one that can readily be converted into an open car for summer use by the removal of the windows and sash. While the car has no side entrance, the closed portion of the sides are much lower than the ordinary closed car, and the construction affords an advantage in the arrangement of seats.

From the accompanying engravings it will be seen that the general appearance of the car is very similar to the ordinary closed type, but its construction is radically different. The sides of the car can be made either straight or curved, as desired, but in this case requires the use of a steam-car truss plank, which is bolted to both posts and sills. The posts are made double and glued together, with a tie rod between them. The sashes are also double, and of much larger size than those ordinarily employed. They are arranged so that when it is desirable to open the car the sashes slide upward on trunnions into pockets framed in the roof, and are entirely out of sight and out of the way. The roof does not appear, from either outside or inside, to vary materially from the ordinary standard forms, as will be seen from a glance at the interior and exterior views. Sufficient space between the lining and roof boards, however, is found to accommodate both sashes.

One of the standard objections to the use of open cars has been the fact that when once in service they had to be continued in operation until the end of the season, the expense and the time required for changing being so great that it was out of the question to attempt to provide closed cars during rains or uncomfortable storms in the summer time. The new construction is so easily operated that the changing from open to closed cars is but a matter of a few minutes and involves no extra expense.

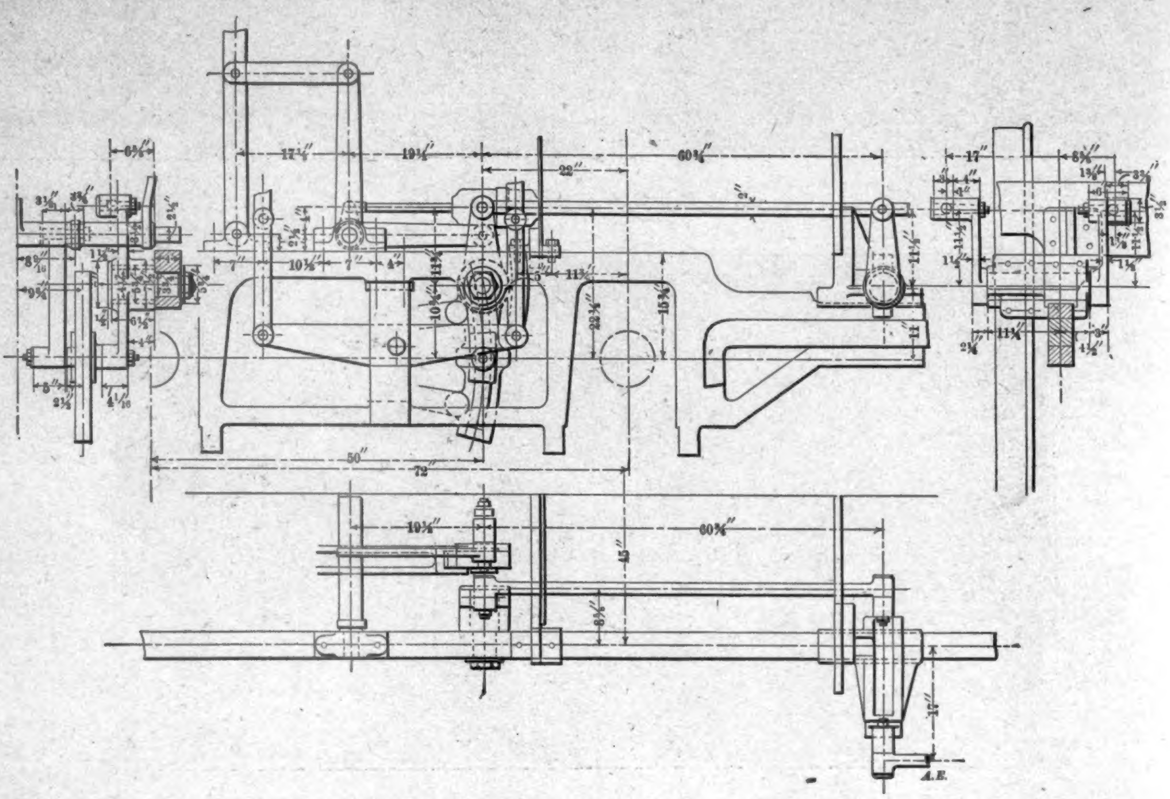
The Economy Car Heating Company's system of heating passenger trains has been in use for the past two winters on several of the largest roads in New England with general satisfaction. This system was illustrated and described on page 129 of the April issue of this paper. It consists simply in using the exhaust steam from the air pump of a locomotive instead of drawing live steam direct from the boiler for this purpose. The economy of such a system is evident, as all the actual steam leaving the pump is utilized, as well as the latent heat in the water of condensation, and the general results are that all the heat leaving the pump is now utilized for heating purposes. This company has a circular describing their system of car heating that will be sent together with any additional information desired. The headquarters of the Economy Car Heating Company are in Portland, Me.

VALVE MOTION TRANSMISSION BAR.

For Atlantic 10-Wheel and Consolidation Locomotives.

Lehigh Valley Railroad.

Through the courtesy of Mr. F. F. Gaines, Mechanical Engineer of the Lehigh Valley Railroad, we have received a drawing of an attractive and simple arrangement of the valve motion transmission bar whereby the usual curved bar or back-connected motion is avoided. The various methods of dodging the forward axle of Atlantic, 10-wheel or consolidation engines, have been illustrated in this journal at different times. That used on the Southern Railway is shown on page 83 of the March, 1898, number, the Pennsylvania plan for consolidation and Atlantic types in June, 1899, page 183, and June, 1900, page 168.



Simple Arrangement of Valve Motion Transmission Bar.

In the Lehigh Valley plan the link block drives the lower of a pair of rocker arms which are journaled on a pin which is secured in a boss forged on the frame. A straight rod connects the upper of these arms, over the forward axle to another pair of rockers, which, in this case, are both above the center of the rocker box. These may be like the arms at the links, both in the same plane if necessary, this arrangement being the one used in the 10-wheel engines illustrated on page 312 of our issue of October, 1900. The present engraving shows how conveniently the equalizer may be arranged without the slightest interference with the valve gear and also how the rocker shaft to take the motion outside of the frames may be moved ahead of the driving wheels where it also will be out of the way.

This general plan has been adapted to a number of different classes of engines on the Lehigh Valley, including those hauling the "Black Diamond Express." It has also been adopted for two new classes of engines now being built by the Baldwin Locomotive Works for the Long Island Railroad.

Mr. P. S. Blodgett, General Superintendent of the Lake Shore & Michigan Southern, has been appointed General Superintendent of the New York Central & Hudson River, succeeding Mr. Edgar Van Etten, who was recently elected Second Vice-President.

The Empire State Express of the New York Central & Hudson River Railroad has been improved to better accommodate the increasing travel between New York and Buffalo. It is one of the most luxurious of day trains. It is composed of one combination smoking and baggage car, two day coaches of the largest and most modern construction, and one Pullman observation car. The train was designed with the object of carrying a greater number of passengers with less dead weight than formerly. Instead of the usual type of dining car the day coaches may be converted into dining cars, and meals will be served a la carte from the Empire kitchen placed in one end of a coach.

Mr. F. A. Delano, Superintendent of Motive Power of the Chicago, Burlington & Quincy, has been appointed General Manager, to succeed Mr. W. C. Brown, who recently resigned to enter the service of the Lake Shore. Mr. Delano has had a long experience on the Burlington, and his appointment to take charge of the operating department is a recognition which we are heartily glad to record. Mr. Delano's experience covers operating and motive-power matters, and is, in our opinion, the best possible preparation for a general manager. Mr. Delano is a graduate of Harvard University. In 1885 he entered railroad work as a machinist apprentice in the motive-power department of the Burlington at Aurora. He made a special study of steel rails, including a complete record of the rails on the road, extending his investigations over two years. From 1889 to 1899 he was in charge of the freight terminal of the road in Chicago, and in February, 1899, was appointed Superintendent of Motive Power, to succeed Mr. G. W. Rhodes. During his administration in the motive-power department Mr. Delano's influence was strong in improvement, and the recent introduction of moderately wide grates for locomotives was hastened by his bold and confident stand. He brought into the consideration of motive-power matters a broad-minded business policy, and he goes to his new position with what every manager would find helpful—a thorough knowledge of motive-power problems. Mr. J. F. Deems succeeds Mr. Delano as Superintendent of Motive Power. He also has won his recognition by years of conscientious, well-placed hard work and clear thinking.

The latest development in metal covered sheathing for use in building railway coaches was shown in an exhibit of the Metal Plated Car & Lumber Co., of New York, at the recent convention of the Master Mechanics and Master Car Builders Associations. The exhibit consisted of a full-sized corner section of a passenger coach. The many advantages of this covering and the pleasing permanent finish which the copper takes when oxidized makes it a very satisfactory covering not only for railway cars, but steamships and structural work, and one that experience has proved in railway service to be economical. This improvement consists of covering each piece of wood sheathing, paneling, belt rails, letter boards, etc., with sheet copper. It is applied to the sheathing before it is assembled. It is applied in such a way that the metal fits "skin tight" to the wood, makes all joints absolutely water tight and gives the exterior of the car a smooth finished surface. When once this covering is applied no further expense is required in maintaining its permanent rich color, as the use of paint or varnish on the exterior of the car body is wholly unnecessary. In first cost this covering is more expensive than paint, but it offers important advantages in permanence and in the saving of time required for painting and varnishing. This system is the invention of Mr. W. P. Appleyard, Master Car Builder of the New York, New Haven & Hartford R. R.

The Metal Dust Guard Co. has placed on the market a very simple, durable and cheap dust guard, the body of which is made of one piece of heavy felt, oval in shape and braced on the sides by a broad ring of galvanized iron. The perfect fit of this guard prevents the entrance of dust and the exit of oil and gives proper protection to the bearing and journal. A block of wood is inserted in the top of the slot of the box and excludes dust at that point. The guard is free to move up and down in the box and being made in one piece sets itself to the journal. The surface of the felt in contact with the journal becomes glazed over when oil reaches it and in this case there is no wear to the felt. This company has offices at 403 Equitable Building, Baltimore, Md., and will be pleased to correspond with those interested in this felt dust guard.

The exhibit of the Lunkenheimer Company at the Master Mechanics' convention consisted of a full line of their injectors, gauge-cocks, cylinder cocks, stop and check valves and chime whistles. Of these the Lunkenheimer '99 model injector, which was shown in two full-sized sections, attracted considerable attention. This standard injector, which has just been placed on the market, differs in a number of particulars from other injectors. It is designed for high-pressure service, is not affected by variations of steam pressure and the manufacturers claim that it will start promptly and can be depended upon to work reliably at all steam pressures from 25 to 300 lbs. and higher. The company has just issued a catalogue which gives directions for placing and operating the injector. This pamphlet will be sent with any additional information desired, to those who will correspond with the Lunkenheimer Company, at Cincinnati, Ohio.

Upon a recapitulation made by the officials of the Pressed Steel Car Company of Pittsburgh, it was found that, including the cars built during May, 1901, the total number of cars shipped since the industry began four years ago is 40,578. At the present rate of production, the company will build this year nearly as many cars as have been constructed since the inception of the company. During May the total number built and shipped was 2,705, an average of a little over 100 cars for every working day. This average has been kept up for several months and the officials of the company believe that in the future the average will be even greater than it has been in the past. The enormous output of this company can best be realized when it is known that in addition to the cars built there is a large output of bolsters, truck frames, center plates, brake beams, etc., and that in May alone the consumption of steel amounted to over 40,000 tons. With this amount of steel plates and steel structural material, 13 steamers 500 ft. long, 50 ft. beam and 50 ft. deep could be constructed.

CORRESPONDENCE.

COST OF CAR PAINTING BY SPRAY AND BRUSH.

To the Editor:

There is a wide difference of opinion as to the relative merits of painting freight cars by spraying or by brush. The arguments against spraying are that contract shops do not use this method and that it wastes paint.

If properly used there is no waste of paint, as has been shown by erecting a canvas tent with canvas floor and spraying a number of cars inside the tent. The weight of the canvas before and after showed the waste of the paint, which amounted to but a few ounces.

The following test made by a large railroad system needs no comment. It shows that contract shops using brushes can not compete with the sprayer. Lucol paint was used, which has special advantages for spraying and which finishes a repainted car with one coat, giving a good uniform gloss, with no flat spots.

Cost of Spraying Cars.

The following is the test record:

Spraying.

A. and D. car No. 1196 (in fair condition), sides and ends, 684 sq. ft. Paint used, 13 lbs.		$.95¼
Time required, 26 minutes		.06½
Total for body		$1.01¾
Roof paint, 9 lbs. 3 oz.	$.68	
Time required, 10 minutes	.02½	
		.70½
Total for sides, ends and roof		$1.72¼
R. and D. car No. 3671 (in bad condition), sides and ends, 734 sq. ft. Paint required, 17 lbs. 4 oz.		$1.27¾
Time required, 17½ minutes		.04½
Total for sides and ends		$1.32¼
Roof paint, 9 lbs. 3 oz.	$.68	
Time required, 10 minutes	.02½	
		.70½
Total for sides, ends and roof		$2.02¾

Several other cars were sprayed, all showing the same results as to cost within a few cents. Compare this now with the following figures given by another road using "wall" brushes and two coats of linseed oil, paste and japan dryer. The two coats were necessary to give a gloss. The car repainted was a 36-ft. box car.

Cost with Brushes.

Paint used, 12 gals., at 60 cents per gal.	$7.20
Time required, 3½ hours	.52
Total for sides, ends and roof	$7.72

The $7.72 represents the cost of applying two coats of paint. Because of the qualifications of the paint used with the sprayer but one coat was necessary. By taking half of the $7.22, or $3.86, and comparing it with the $1.72¼ and $2.02¾ a fair comparison may be had of sprayer versus brush. Car Builder.

Direct-Current Machinery.—The Bullock Electric Manufacturing Company has issued a small pamphlet for distribution at the Pan American Exposition. This souvenir catalogue illustrates a varied line of their direct-current electrical machinery, including the types "I," "H," "N" and "E" generators and motors; also type "N-I" Bullock marine generator. No detailed description is given in connection with these machines, but reference is made in each case to a certain bulletin in which that machine is fully described. These descriptive bulletins referred to will be sent to those interested in direct-current motors and generators upon request of the Bullock Electric Manufacturing Company, Cincinnati, Ohio. The pamphlet is prepared in the attractive good taste which characterizes the publications of this company.

The Railway and Engineering Review in its issue for June 15th presents an admirable inset, containing a comparison of the principal dimensions and leading particulars of prominent locomotives constructed in the United States during the last two years. The table occupies a full page and is accompanied by excellent half tones of 12 interesting designs, all of which have attracted special attention. This comparison is the most convenient we have seen and is not the least interesting feature of this excellent number.

(Established 1832.)

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

To Subscribers.—*The* AMERICAN ENGINEER AND RAILROAD JOURNAL *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied.* **When a subscriber changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

IMPRESSIONS OF THE CONVENTIONS.

MASTER MECHANICS' ASSOCIATION.

The introduction of the individual papers at the Master Mechanics' Convention this year began what may become an important improvement if properly developed. Mr. Henderson's treatment of tonnage rating was what would be expected from him. It is as thorough and comprehensive as if it had been a committee report, but in this case the credit will be placed with the author. Mr. Sanderson's paper is also better than a committee report could possibly be, because it was the work of an individual and was not trimmed to meet the opinions of several members of a committee. There is much to be gained by a development of this plan, and not the least of the benefits will come to those who prepare the papers. It offers excellent opportunities for members to improve themselves. Uusally the one most benefited by a paper before a technical association is the author himself.

In discussing boiler-tube practice the extent of the difficulty in keeping tubes tight, and the apparent increase of the trouble with increasing pressures and growing severity of service, indicate the necessity for something radical. The most trouble occurs in bad water districts, which points to the "treatment" of water as the most effective remedy. It is interesting to know that Mr. Kruttschnitt, Vice-President and General Manager of the Southern Pacific, in his article in our June number places water treatment as the first of his suggestions to motive-power officers. He says: "The far-reaching effects of bad water would lead me to place its improvement by chemical treatment as first in importance of the problems that confront motive-power officers of the present day."

Mr. Morris, in his presidential address, struck from the shoulder at the uncertain attitude of the association with regard to the compound locomotive. With admirable facilities at command, the status of the compound should be established, and, to quote Mr. Morris: "We should not be satisfied to let the compound drag itself wearily along into its final resting place in our esteem, when with present-day facilities it is easy to forecast so much intelligently."

In interest, time occupied, and the number of speakers, the round-house report stood first among the subjects. It is apparent that facilities for caring for locomotives at terminals must receive the best sort of attention to meet the demands of progress in operating methods. In connection with round-houses broad-minded men do not hesitate to furnish anything which will contribute to a reduction of the time lost by locomotives at terminals. It was disappointing that the discussion dealt with details instead of the fundamentals, and that nothing was said about the losses of time in caring for engines or the possibilities of reducing them.

If anyone expected a definite statement on the relative merits of cast-iron and steel-tired wheels which would settle the question of superiority and safety, he was disappointed. If the cast-iron wheel is safe in locomotive service it should not be difficult to put it into words. It is difficult to understand why, if the cast-iron wheel is all that its friends represent it to be, its friends do not come out boldly and advocate it for every service. If it is not safe for leading wheels for engine trucks, is it safe anywhere in a train? At the recent convention the views expressed in the article on page 118 of our April issue were abundantly confirmed, viz.: Cast-iron wheels must be greatly improved or they must give place to better wheels, if safety is to be insured. The situation as illuminated by the M. C. B. Association is nothing short of dangerous.

While many other features of the convention are worthy of mention, only one more will be included. It was the closing paragraph in the President's address, which was as follows: "I would like to remind you that the remarkable changes in the ownership and control of some of our largest roads must be taken to indicate most important alterations in the situation in which we are a part, and it behooves us to watch lest we fail in some degree to appreciate what it means to the departments which we represent, and with renewed efforts we must meet the new problems in a way that will inspire confidence and insure absolute progress."

An impression was left by this convention, and also by that of the M. C. B. Association, that progress in operation must be closely studied and followed by motive-power men in order that they may keep ahead of their problems.

M. C. B. ASSOCIATION.

One of the most important subjects was the draft-gear situation. It is thoroughly understood that most of the draft gear in common use is inadequate and that about 75 per cent. of the cost of car repairs goes into the maintenance of these parts. A number of important features were touched upon in the discussion, but only a few real principles were reached. There was a strong sentiment in favor of "continuous" gear, but it was not made clear that a satisfactory device of this kind was available. Continuous draft sills, or the use of center sills, was considered desirable, and there was but one mind as to the desirability of placing the line of draft at or near the neutral axis of the members of the floor system to which the draft gear is attached. There was also a general complaint concerning the rough handling of cars in yards, and many thought that the operating departments should be induced to correct the abuses. The discussion was, however, disappointing to those who hoped for a proper appreciation of the principles involved in providing for the enormous advances which have been made in the power of locomotives and the capacities of cars. These were scarcely mentioned, and the discussion turned on what should be done with old cars and the admittedly weak

gears. It was apparent that the men who understand the situation were not ready to take a hand, but if the tests of the committee are begun before the next convention, their time will come for assuming control of the discussion. A lot of educational work needs to be done in order that all of the elements of the pulling and buffing of cars may be understood. It does not appear to be appreciated that at present the entire structure of a wooden car acts as a buffer. The yielding of the whole floor system saves the day as far as these cars are concerned, but when the next step beyond the wooden underframe is taken, an entirely new condition arises which compels the provision of greater capacity in the gear. The real question is how best to provide the increased capacity. It is surprising that this was not mentioned in any way in the convention, though it was unreservedly discussed in the piazza conversations. Why do the members of this association hesitate to go on record on this subject? It seems advisable and appropriate to refer them to the criticism by Mr. Bush on the opening page of this issue.

Another live topic is the status of the cast-iron wheel. The committee on wheels recommended changes in the direction of lighter wheels, and in the discussion a marked difference of opinion was developed. It was generally admitted that wheel iron had deteriorated because of the large proportion of old wheels used in the mixtures, and it was said that wheels had been remelted a dozen and more times, a practice which was condemned. The lighter patterns were suggested with a view of requiring better iron, but those who had experienced the most difficulty wanted heavier wheels to meet the present crisis. No doubt was left in anyone's mind that something was radically wrong with cast-iron wheels. Next year a report may be expected covering the material, design, form and weight of wheels of various capacities. The association is to be congratulated on the prospect of a thorough examination of the whole question.

In connection with couplers the necessity for more lateral play at the carry-iron seemed to be the most striking factor in the discussion. It was suggested that breakage of couplers and derailments of cars, as well as flange wear of wheels, might be greatly reduced by allowing the coupler to move laterally to permit cars to pass over sharp curves without cramping the draft gear. In addition to this the whole coupler needed strengthening. This subject will come up prominently next year.

Durability is the property most generally sought in buying brake shoes. It seems to be pretty well understood that this involves the use of hard metal, which gives low braking power. The members were reminded that brakes were intended to stop trains and that it was unwise to give undue prominence to the matter of cost. The committee argued in favor of shoes hard enough to last through a long run, but soft enough to give a fair coefficient of friction. They recommended the equivalent of a hard cast-iron shoe.

It has never been the practice of this association to establish prices sufficiently high to permit of making profits in repairs. In the case of the cleaning of triple valves, however, the wisdom of such prices is apparent. It will now be easier to maintain air brakes in good order, concerning which Mr. G. W. Rhodes presented an able argument in our June number.

The discussions this year were unusually general and thoughtful, and they gave evidence of considerable advance preparation.

Mr. W. C. Brown, General Manager of the Chicago, Burlington & Quincy, has been elected Vice-President and General Manager of the Lake Shore & Michigan Southern, with office at Cleveland, O. Mr. Brown is 48 years of age, and has had a remarkably wide experience dating from 1870, when he entered the service of the Chicago, Milwaukee & St. Paul as a section hand. He advanced rapidly through various responsible positions, and in 1896 was appointed General Manager of the Chicago, Burlington & Quincy.

PERSONALS.

Charles Henry Burns, Master Mechanic of the Houston & Texas Central, died recently. He had been in the service of that company for 25 years.

Mr. J. P. Neff, Foreman of the Waseca shops of the Chicago & Northwestern, has been appointed General Foreman at Huron, S. D., succeeding A. B. Quimby.

Mr. J. J. Sullivan, General Foreman of the Louisville & Nashville shops at Louisville, has been appointed Master Mechanic, and will have charge of all mechanical matters pertaining to the terminal facilities at Louisville.

Mr. David W. Ross, for several years Chief Clerk to Vice-President Harahan, of the Illinois Central, has been appointed Purchasing Agent of that system, with headquarters at Chicago, to succeed Mr. C. A. Beck. Mr. Beck will remain in the service of the company as Chairman of the new board of pensions.

Mr. A. E. Manchester has been appointed Superintendent of Motive Power of the Chicago, Milwaukee and St. Paul, in the place of Mr. S. P. Bush, resigned, to become General Manager of the Buckeye Malleable Iron & Coupler Company. Mr. Manchester is 53 years of age, and his entire railroad career has been spent with this road. He began service in 1864 and has been consecutively 5 years Machinist, 17 years Round House Foreman, 3 years General Foreman of the Locomotive Department, 4 years Division Master Mechanic, and from 1893 to date Assistant Superintendent of Motive Power.

Mr. John W. Kendrick has been appointed Third Vice-President of the Atchison, Topeka & Santa Fe. He leaves the office of Second Vice-President of the Northern Pacific after a splendid career of 22 years with that road. Mr. Kendrick is 47 years of age, and began his railroad service with a construction party of the Northern Pacific in the Yellowstone Valley. During the past few years Mr. Kendrick has had associated with him in his work Mr. McHenry, and to these two gentlemen is due the success of the remarkable work in reconstructing the road and equipment of the Northern Pacific.

Mr. John S. Chambers has just been appointed Superintendent of Motive Power of the Atlantic Coast Line, with headquarters at Wilmington, N. C. Mr. Chambers is 43 years old, and began his railroad career in 1886 as a machinist in the shops of the Wabash, St. Louis & Pacific. Since that time he has held respectively the following positions: General Foreman, Kansas City & Northwestern; General Foreman and Master Mechanic, St. Joseph Terminal; Master Mechanic, Illinois Central; Superintendent of Motive Power, West Virginia Central & Pittsburg; Master Mechanic, Buffalo Division Lehigh Valley; Master Mechanic, Central Railroad of New Jersey, from which position he recently resigned.

Mr. William H. Newman, President of the Lake Shore & Michigan Southern, was elected President of the New York Central & Hudson River Railroad at a special meeting of the board in New York June 3 to succeed Mr. Samuel R. Callaway who resigned to accept the office of President of the American Locomotive Company. Mr. Newman began his railroad career July 1, 1869, at the age of 22, as station agent on the Texas & Pacific, at Shreveport, La., and in 1872 was appointed General Freight Agent of the same road. This position he held until 1883 when he became Traffic Manager of the Gould Southern System. From 1885 to 1887 he was Traffic Manager of the Missouri Pacific System, and then chosen Third Vice-President. He was made Third Vice-President of the Chicago & Northwestern in 1889 and in 1896 entered the services of the Great Northern as Second Vice-President in charge of traffic. This position he held until 1898 when he was called to the Presidency of the Lake Shore & Michigan Southern. He has also been re-elected to the presidency of the "Lake Shore."

BOOKS AND PAMPHLETS.

Hand Book of Patent Law, Patent Office Procedure, Trademarks and Copyrights. Published by J. A. Osborne & Co., Cleveland, O. Revised edition.

The object of this little book of 112 pages is to answer most of the questions usually asked by inventors, manufacturers and patent users. It is full of useful information and the index shows a great variety of subjects treated. Those who are interested in patents will be able to procure a copy of this pamphlet by addressing J. A. Osborne & Co., Patent Lawyers, 508 The Arcade, Cleveland, O.

Index to Engineering News for the years 1890 to 1899 Inclusive. Compiled by Mary E. Miller, Librarian, Equitable Life Assurance Society. Octavo, cloth, 324 pages. Published by Engineering News Publishing Co., St. Paul Building, New York, 1900. Price, $2.50.

The accumulation of engineering literature is so rapid in these days as to render every work of this character exceedingly valuable. It was entrusted to a trained expert who eliminated all but the matters of permanent value and arranged the references logically and conveniently. The enterprise which prompted this undertaking is heartily commended. It renders available a large amount of valuable literature which would otherwise be lost to most busy men because of the difficulty of locating it with the usual volume indexes. The book is well printed in satisfactory type and is exceedingly creditable.

Gas and Fuel Analysis for Engineers. A compend for those interested in the economical application of fuel. By Augustus H. Gill, Assistant Professor of Gas Analysis, Massachusetts Institute of Technology. Second Edition, 89 pages, illustrated, cloth. Published by John Wiley & Sons, 43 E. 19th St., New York, 1900. Price, $1.25.

This little book is important to those who have to do with steam boilers, because it presents in concise form the subject of chimney gas analysis which is becoming appreciated as a convenient and easy method of studying the performance of steam boiler furnaces. Its substance was given originally in the form of notes to students in mechanical and electrical engineering, which, owing to an expressed demand for a wide circulation, was prepared for book form. It is the result of six years' experience in the instruction of classes and is believed to be the only work on this subject in the English language. It is by no means merely a class text-book, but is a valuable assistant to the engineer. Boiler practice has reached a stage in which the differences between the results of various methods of abstracting heat from the furnace gases are relatively small, but the importance of proper furnace conditions is as great as ever. Because of the convenience of the method, gas analysis is the best and in many cases it is the only one for the study of furnace conditions. The author deserves great credit for this excellent and valuable work, which cannot fail to receive the appreciation of the engineer. It is commended to our readers for careful study because the improvement of combustion is one of the greatest fields open to the engineer.

Hydraulic Tools.—A new catalogue of hydraulic bending machines has just been issued by the Watson Stillman Company, New York, manufacturers of a very large line of high-pressure hydraulic tools for all purposes. This catalogue, No. 59, is devoted entirely to hydraulic bending machines. Among those illustrated and described are various styles of girder and rail benders, pipe benders and bending jacks, bar straightening presses, plate straighteners and forming presses, beam benders, sheet metal benders, garboard strake benders, shaft and car axle straighteners and improved crank pin presses. The last two machines are also illustrated on page 160 of the May issue of this paper. A new catalogue illustrating and describing hydraulic jacks has also been received. This book is a new edition of the company's former catalogue No. 54 and contains considerable additional matter. New sizes and styles of jacks have been added and certain parts have been entirely revised. These catalogues are standard size, 6 x 9 ins., and the pages are all given a file number, so that separate sheets describing any machine in the lists may be had upon application to the main office, 204 East Forty-third street, New York. This company has exceptional facilities for making any special machine in these lines and will be glad to correspond with those wanting tools which are not illustrated in these catalogues.

"A Step Forward" is the title of a little pamphlet just issued by the Bullock Electric Manufacturing Company, Cincinnati, announcing the consolidation of their sales departments with those of the Wagner Electric Manufacturing Company, St. Louis. This booklet also contains some information about these two companies of which a few brief remarks were given in the May issue of this paper, page 166. The new organization will be under the management of Mr. E. H. Abadie, former Sales Agent of the Wagner Company.

Brake Shoes.—This little pamphlet was prepared by the American Brake Shoe Company, Chicago. It illustrates and describes six different driving brake shoes and four styles of shoes for coaches and cars, all of which have distinguishing features. The catalogue is issued for distribution at the coming M. C. B. and M. M. conventions at Saratoga. Copies were distributed at that time. It presents in an attractive and concise manner a great deal of information concerning these well-known brake shoes.

Graphite Productions.—The Joseph Dixon Crucible Company has just issued a catalogue which covers very fully their graphite productions. In addition to a general description of the great variety of Dixon's graphite productions this catalogue contains some excellent engravings of the company's graphite works at Ticonderoga, views of the graphite mines and cedar mills and the main works at Jersey City. The press work of the pamphlet represents a high degree of perfection which, added to the other good features, make it an unusually attractive catalogue.

The Pressed Steel Car Company, of Pittsburgh, has just issued a catalogue which is the best pamphlet on steel cars that has been received at this office. The catalogue shows by many excellent engravings the latest designs of hopper, box, furniture, gondola and ballast cars with the improvements that have been developed from the results of actual service. In addition to a variety of trucks for all equipment which are shown by full-page engravings, are standard types of pressed steel body and truck bolsters, side stakes and pockets, brake beams, center plates and other pressed steel specialties for general car equipment. The book also gives tables of figures taken from daily reports showing the advantages of pressed steel cars and valuable testimonials from motive power and operating officers. The catalogue is standard size and is a good example of the best, up-to-date catalogue literature.

Air Compressors.—An illustrated pamphlet has just been issued by the Rand Drill Comvany, 128 Broadway, New York, giving general and detailed descriptions of their "Imperial" Type X air compressors, designed for both simple and compound, double-acting, steam and air cylinders. The pamphlet also illustrates and describes their Type XI belt driven air compressor and Type VII air compressors with duplex or compound steam cylinders and multiple stage compression cylinders. Tables of dimensions and capacities of the various sizes are also given in the catalogue.

"A. B. C." Mechanical Draft.—In this little pamphlet, which has just been issued by the American Blower Company, of Detroit, is given in a concise but comprehensive manner the advantages of mechanical draft. The book is illustrated by clear engravings of fans, blowers, steam engines, both vertical and horizontal, and the methods of applying forced and induced draft. In the back of the pamphlet are given some miscellaneous tables for handy reference from which mechanical draft plants may be designed. Catalogues giving detailed information of any particular line of this company's products will be furnished upon request at the office of the American Blower Company, Detroit, Mich.

Locomotive Inspirators and Injectors.—In this catalogue, just issued by the Hancock Inspirator Company, of Boston, are given brief illustrated descriptions of their locomotive inspirators and various attachments for the locomotive, together with the Hancock inspirator, types "A," "B," "D" and "Composite," and locomotive injectors. An important advantage of these different types of inspirators is that the repair parts of all can be replaced with one standard set of parts. In addition are illustrations of the Hancock Main Steam valve and Main Boiler valve, a new double check valve and improved hose strainer. The catalogue is very complete, covering the subject fully.

Elevating and Conveying Machinery.—The Jeffrey Manufacturing Company has just issued a circular, No. 61, of elevating and conveying machinery for mills, factories, mines, industrial and power plants. The circular illustrates a number of the ways in which their products are used. For those desiring a complete description of any line of these equipments a catalogue will be sent upon application to the Jeffrey Manufacturing Company, Columbus, Ohio.

"The Cause of Foaming in Locomotive Boilers and Other Papers" is the title of a pamphlet republished by the Industrial Water Company, of New York. It gives in concise form three valuable papers by C. Herschel Koyl, one on The Cause of Foaming in Locomotive Boilers, a second on Pure Water for Locomotives by Evaporation, and a third on The Purification of Feed-Water. The book is illustrated by several engravings, among which is a continuous and automatic water softing and purifying machine, built by this company, and a "Yaryan" multiple effect evaporator in use at the works of the Perim Coal Company, on the Red Sea. The address of the Industrial Water Company is 15 Wall street, New York.

The American Brake Company, St. Louis, has issued a 1901 catalogue illustrating and describing the American automatic slack adjuster, a device for maintaining constant and uniform piston travel in air brake cylinders, and to compensate for the varying conditions of leverage and brake shoe wear, thus insuring uniform cylinder pressure and brake shoe effect. To show the application of this slack adjuster to quick-action passenger and freight car brakes, and locomotive truck and tender brakes this catalogue contains a number of colored folding plates with explanations. The book also gives detailed illustrations of the adjuster itself and of the standard Westinghouse cylinder heads for use in connection with this device. For freight car and locomotive trucks, where there is considerable variety of construction, this company will be pleased to submit without cost, upon receipt of suitable data, working drawings of brakes with the American automatic slack adjuster applied.

Inventors' Manual: How to Make a Patent Pay. By an experienced and successful inventor. Revised and enlarged edition, including the 1900 census of the United States by counties. Bound in cloth, 119 pages. Published by Norman W. Henly & Company, 132 Nassau street, New York, 1901. Price, $1.

This book tells how to introduce and dispose of an invention. It is a guide to the inventor in perfecting his inventions, taking out patents and disposing of them, with general hints to the inventor and patentee. Among the subjects treated are: How to invent, how to secure a good patent, how to exhibit an invention, how to interest capital, how to estimate the value of a patent, and the value of a good invention, good design, foreign patents and of small inventions. The volume also gives advice on the selling of patents, formation of stock companies, formation of limited liability companies, disposing of old patents and advice as to selling agents, forms of assignments, license and contracts, and State laws concerning patent rights. The author of the book has had a long and sucessful experience as an inventor and the principles of his success as laid down in this manual make it a useful book to those who have to do with patents.

EQUIPMENT AND MANUFACTURING NOTES.

The Babcock & Wilcox Company has removed its New York offices to 85 Liberty street, twelfth floor.

The coach roofs of the President's train on his recent trip to the Western coast were painted with Superior Graphite Paint furnished by the Detroit Graphite Manufacturing Company, of Detroit, Mich.

The Sargent Company on May 29 elected the following officers: Chairman of the Board, Geo. M. Sargent; President, W. D. Sargent; Vice-President and Treasurer, H. K. Gilbert; Secretary, Day McBirney.

An order for 250 steel gondola cars for use on the Government Railways of Australia in New South Wales was recently received by the Pressed Steel Car Company, through its foreign agents, the Transportation Development Company, Inc.

The Westinghouse Air Brake Company has absorbed the Standard Air Brake Company and will manufacture air brakes for street and interurban railroads on an extensive scale. The plant of the Standard Company will be moved to Wilmerding, Pa.

The Dry Color Plant of The Mamolith Carbon Paint Company, located at Poplar Bluff, Mo., was damaged by fire on the 11th of June, loss about $5,000. The company will rebuild immediately and will be able to handle its business without any delays, as their stock of pigments at the Cincinnati and New York works are ample to provide for filling all orders promptly until the dry color plant at Poplar Bluff is rebuilt.

Two Pedrick & Ayer air compressors will be used in a novel way at the Pan-American Exposition for supplying compressed air to a Baldwin locomotive which is to be jacked up off the track and operated in this position. The compressors are compound, automatic, belt driven and will pump the air into the boiler of the locomotive from which it will be used in the cylinders as the motive power for turning the wheels.

The transcontinental limited train of the Santa Fe System, which has heretofore been operated only through the winter months, when tourist travel is heaviest, is to be continued in service as a semi-weekly train both to San Francisco and Los Angeles. Each car on the train will be equipped with electric fans and the service in other respects will be the most desirable for a summer journey to the coast. The train leaves Chicago Tuesdays and Saturdays. East-bound it will leave San Francisco and Los Angeles Mondays and Thursdays.

It will surprise most people to discover that the population of China is greater than that of Russia, Great Britain, Germany, France, Japan and the United States combined, and that China has a population capable of bearing arms of almost 100,000,000. In those other elements which go to make up a nation's potential strength, such as vitality, endurance, indifference to discomfort, ability to subsist on the smallest rations and to thrive amid unsanitary surroundings, the Chinese are unmatched.—From No. 28 of the New York Central's "Four Track Series."

Now that the damaged portion of the old plant of the B. F. Sturtevant Company has been made habitable and the effects of the fire have been overcome, attention is being turned to the selection of another site and the consideration of plans for an entire new plant. It is more than likely that the selection of a site will be in the vicinity of Boston and it is certain that it will be one that presents the most favorable conditions as regards shipping facilities, proximity to a skilled-labor center, water supply, etc. The plant itself will of necessity consist of a power house, large foundry, blower, heater, forge, engine, electrical and galvanized iron shops with administration building and pattern shop. Between five and ten acres of floor space will undoubtedly be required to meet the present requirements, while the available land for future extensions must be from fifteen to twenty acres.

The A. S. Cameron Steam Pump Works of New York have a very fine exhibit of their pumps at the Pan-American Exposition at Buffalo. The exhibit consists of eight of the Cameron pumps showing a variety of the direct-acting type and including the following: The "regular" type for general service, the special "boiler feeder" pump, the vertical piston mining pump, vertical plunger sinking pump, the horizontal plunger station mining pump cut in sections for mule-back transportation in mountainous countries, the sectional plunger sinking pump, the vertical engine and deep well pump for artesian wells and a pump cut into sections to illustrate the mechanism and principle of operation of the Cameron type of pump. The exhibit is shown in the Machinery Division of the Transportation Building in block No. 25, and is in charge of Mr. P. E. Leahy, President of the National Association of Stationary Engineers and Consulting Engineer for the Cameron Company.

MASTER MECHANICS' ASSOCIATION.

Thirty-Fourth Annual Convention.

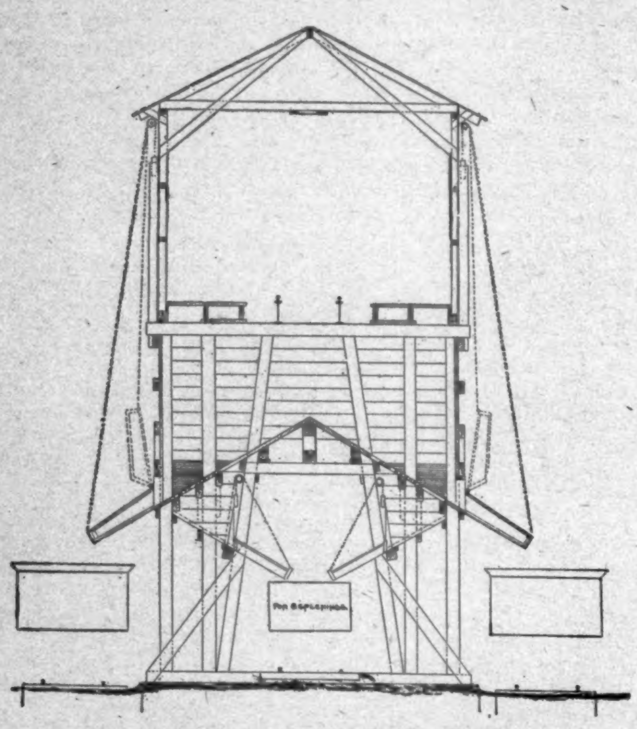
Abstracts of Reports.

WHAT IS THE MOST IMPROVED METHOD OF UNLOADING LOCOMOTIVE COAL PRIOR TO BEING UNLOADED ON THE TANK?

Committee—W. Garstang, T. S. Lloyd, W. E. Symons.

Your committee has endeavored to present a series of cuts that will give an excellent general idea of the different arrangements. It has been impossible to present all of the plans in detail, but it has been the aim to present in more or less detail all of the peculiar features, but only once where the same principle has been embodied in two or more plants. There has been no effort to present any data on the means of furnishing power to operate the conveyor or machinery in the plant, as location, surrounding conditions and amount of power required would have to be taken into consideration for each individual location.

For instance, when a plant is situated close to shops equipped with electric power, the electric motor is the simplest and probably the most economical. At another point where fuel is cheap and steam can be used to advantage for other purposes than hoisting, such as pumping water, no doubt the steam boiler is the cheapest arrangement, while at other points the greatest economy can be gotten by the use of the gas engine. In deciding on the kind of power, unless the plant is operated by electricity and is close enough to a shop station to have some part of the building heated by steam for the comfort of the operators, it is safe to say that the steam boiler, at least in winter months, would be the most economical, otherwise the amount of coal burned in heating stoves would probably be sufficient to operate the plant and furnish the heat also.



Lehigh Railroad Valley Coaling Station.

It is the opinion of the committee that the expense of coaling engines is governed entirely by the kind of cars in which the coal is handled, without reference to the kind of plant in which it is handled, provided the plant is one that will admit of dumping the coal to either bin or conveyor.

If the coal is received in hopper bottom or side dump cars, the cost will probably be between 1 and 3 cents per ton delivered on the tender, no matter whether the cars are pushed up an incline and dumped into pockets or whether the place of the switch engine is taken by other power operatng a system of conveyors.

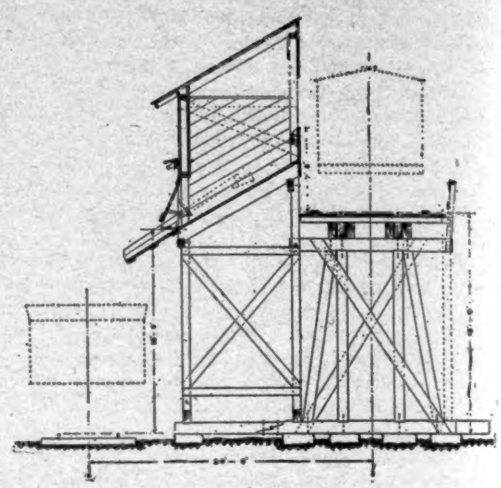
On the other hand, if the coal is received in gondola or box cars and has to be shoveled from the car, the cost will be from 6 to 8 cents per ton delivered on the tender, regardless of the kind of coaling station through which it is handled.

The advantages of the power plant seem to be in more independence at the coaling station, not being required to wait for switching crews, the better housing of the fuel and the ability to have large storage which can be cheaply and quickly handled. Especially important would this seem to be in winter months in locations subject to severe cold weather, when the movement of coal is often slow.

Your committee regrets not being able to furnish the cost of building the various plants shown, but members operating them can probably answer this question.

An item of importance to many roads is the ability to weigh or measure the coal to individual engines. There are four systems now in use; the first, to fill the ordinary coaling bucket which is handled on to the tender by hand or air operated crane. Second, by filling the pocket to a given mark or making the pocket of a given capacity. Third, by the balance pocket operating a dynamometer, and fourth, by having a pocket supported on scales.

Of the plans considered four commend themselves as having special advantages and would cover all general conditions: First, a cheap station operating gondola or coal cars, using the bucket as a means of measuring and transferring the coal to the tender with the air-operated crane, such as is used at many small stations on the C. C. C. & St. L. Ry. Second, the single or double pocket of large capacity, delivering coal directly to the tender or from a measured car of small capacity, as on the Erie R. R. Third, the large pocket, the total contents of which is weighed by the dynamometer, as largely used on the Northern Pacific R. R. Fourth, the measured pocket with storage underneath and its automatic adjustment, as used on the Michigan Central R. R. This arrangement seems an ideal one, as it admits of any extension or capacity; can be operated by drop bottom, side dump, gondola or box cars; automatically weighs the coal to measure and provides large storage capacity.



Chicago Great Western Railway Coaling Station.

COST OF RUNNING TRAINS AT HIGH SPEED.

Committee—Wm. McIntosh, G. F. Wilson, F. A. Delano.

Editor's Note.—This is a lengthy report consisting of data from various roads, but with the exception of that from Mr. Quayle of the Chicago & Northwestern and Mr. Delano of the Chicago, Burlington & Quincy, none contained results of tests. The information given by Mr. Quayle was presented in substance in the article by Mr. G. R. Henderson in the American Engineer and Railroad Journal in June, 1900, and that by Mr. Delano is given in abstract below. These two contributions are selected as being the most valuable offered by the committee.

Contributed by Mr. Delano.

I submit as evidence on this matter of cost of running trains at high speed, a report made in July, 1900, on the C. B. & Q. R. R., under my jurisdiction on fast mail train No. 15, between Chicago and Burlington, a distance of 206 miles, the schedule of the train, including stops, being fifty-one miles per hour. Three trips were made with this train and two trips were made with a dummy train of practically the same weight, but making only half the speed. The data of the tests is given fully in the report made by Mr. H. T. Wickhorst, Engineer of Tests, who had direct charge of the work, with a staff of assistants, but I would call attention to several particular features.

First. The test was made at a time of the year most favorable to low cost of train operation. Second. The train was exactly on schedule time and there was, therefore, no time to be made up and no accident or hot boxes causing a delay which had to be made up. Third. In spite of the above fact, it is interesting to note the speed at which most of the miles had to be made in order to keep the train on schedule time. It will be noted, for example, that the greater part of the distance had to be covered at a speed of sixty to sixty-five miles per hour. Fourth. It is estimated that the value of the high-speed engine on the fast mail train (weighing seventy-four tons in working order) was $14,000, as against the value of say $7,000 for the engine (weighing forty-one tons in working order) which handled the test train operating at only one-half the speed.

In regard to breakdowns, it is pretty apparent that there are a great many more cases of delayed trains due to hot bearings on engines and cars where the speed is excessive than where it is moderate. On some divisions of the road where speed is moderate we never have a case of hot crank pins, whereas hot crank pins and hot driving boxes are not uncommon in high-speed service.

We use our very best power in high-speed service, and in spite of this we have more failures in high-speed service than in moderate service, but just how much more I am unable to say.

I feel quite certain that the increase in speed of a few trains has a tendency to quicken the speed of all trains, first, because the men get educated or keyed up to a high speed, and secondly, because it is necessary to make high speed in order to keep out of the way of trains, even on a double-track road.

The greater speed of trains, both freight and passenger, which has come with recent years has greatly increased the requirements for large boiler capacity of freight as well as passenger engines. High speed has developed a good many weak points in the machinery of engines which under more moderate speeds gave good service. There is very little question that this enhances the first cost of the motive power, but just how much it would be difficult, if not impossible, to say. To combine speed with great tractive power is a difficult thing to accomplish because, in the nature of things, the requirements are contradictory, and in attempting to satisfy opposing conditions is of course more or less of a compromise.

Mr. Wickhorst's report is as follows:

I submit herewith dynamometer car tests made with fast mail train 15, compared with special train of the same make-up, but run at one-half the speed, the test to be made primarily to show relative drawbar pulls and speeds and also to show relative coal and water consumption. We made three tests with train 15 and two tests with the special train. The dates and make-ups of the different trains are shown on the following table:

Fast Mail Train No. 15.

Car.	July 20, 1900. No.	July 20, 1900. Weight in lbs.	July 22, 1900. No.	July 22, 1900. Weight in lbs.	July 23, 1900. No.	July 23, 1900. Weight in lbs.
Dynamometer	Z	34,000	Z	34,000	Z	34,000
Baggage	707	69,400	707	69,400	707	69,400
Baggage	766	69,600	766	69,600	766	69,600
Mail	930	73,800	930	73,800	931	74,000
Mail	914	79,600	914	79,600	915	79,300
Contents	...	50,000	...	25,000	...	25,000
		376,400		351,400		351,100
Total weight behind engine tender	...	188.2 tons	...	175.7 tons	...	175.5 tons

Special Train.

Car.	July 26 and 27, 1900. No.	Weight in lbs.
Dynamometer	Z	34,000
Baggage	706	65,200
Baggage	763	70,900
Mail	932	75,200
Mail	913	74,400
		319,700
Total weight		159.85 tons

The weights of the cars are the actual weights. The weights of the contents or mail on train No. 15 are estimated weights. Train No. 15 was run on its regular schedule. The special train was run on a special schedule made by doubling the time between stations and stops of train No. 15. A condensed time schedule of the two trains is given below:

		No. 15.	Special.
Union depot, Chicago	Lv.	9.30 P. M.	8.25 A. M.
Mendota	Ar.	10.55 P. M.	11.15 A. M.
Mendota	Lv.	10.59 P. M.	11.23 A. M.
Galesburg	Ar.	12.24 A. M.	2.13 P. M.
Galesburg	Lv.	12.27 A. M.	2.19 P. M.
Burlington	Ar.	1.22 A. M.	4.09 P. M.

The train No. 15 made its regular schedule stops, which are as follows:

	Miles.
Canal and Sixteenth streets	1
Western avenue	4
Mendota	83
Galesburg	163
Burlington	206

The special train on July 26 was started 13 minutes behind its schedule time, leaving Chicago 8:38 as second No. 13, and besides the regular scheduled stops as per above, we were also compelled to stop on account of being blocked by No. 13 at the following points: Montgomery, Wyanet.

The special train on July 27 was started from Chicago at 8:10, 15 minutes ahead of its schedule as an extra train. On this run also we had to make stops outside of the schedule, which were as follows: Princeton, Wyanet (three times), Buda, Monmouth.

We made no attempt to correct our calculations for these extra stops. On trains No. 15 we use 'Columbia' type engine 1590. This engine has 18 by 26-in. cylinders, 200 lbs. steam pressure, 84¼-in. drivers (nominally), and weight on drivers 84,450 lbs.; cylinder tractive power, 17,000 lbs. On the special train we used engine 1121. This is an American type 8-wheel engine, 17 by 24-in. cylinders, 160 lbs. steam pressure, 69-in. drivers and weight on drivers 53,600 lbs.; cylinder tractive power, 13,500 lbs. The idea of using different engines in the two different kind of runs was to have the class of engine best adapted to the service in each case.

The tests consisted of determining with the dynamometer car the drawbar pulls, or, in other words, the resistances of the different trains, and also the running speeds. We also kept records of the coal used, water consumption and steam pressure. Coal used was the best grade of screened lump Illinois coal. Method of determining the amount of coal was as follows: Before the trip, the empty tender was weighed on track scales and then coaled up and reweighed. This gave us the amount of coal supplied. A small separate amount of coal was used to fire up the engine and take it from the Western avenue roundhouse to the train in the Union depot, the coal taken into account in our tests being only that required to actually run the train. At the end of the trip we weighed the coal left and thus arrived at the coal used during the trip. The method of determining the water consumption was as follows: The tank was first calibrated to determine the amount of water in the tank for each ¼-in. height of the water. This was done by filling up the tank, placing the tender on track scales, allowing the water to run out and determining the weight at each ½ in. In making the test, the level of the water in the tank was determined just before starting out, then the height at arrival at Mendota, and the height after taking water at Mendota; the same at Galesburg; the level again taken on arrival at Burlington, care being taken to have the water level in the boiler the same at the end of the trip as at the beginning. The temperature of the water was also taken when starting out and also just before and after taking water. The drawbar pulls and the running speeds were recorded automatically in the dynamometer car. After making the trips, we went over the record paper and determined with a planimeter the average drawbar pull, or, in other words, the average train resistance for each half mile of each trip. We also determined the average running speed for each half mile of each trip. The work of determining the drawbar pulls and running speeds was done by Messrs. John G. Crawford and George Ristine, Jr., students of Cornell University, who took part in the tests and worked up the data and results:

It will be noticed from the various blue prints (Not reproduced here.—Editor) that the average running speed of the special trains was just about half of the speeds of train No. 15, while the average train resistance per ton was a little less than half. The water per ton-mile was about two-thirds and the coal per ton-mile was a little over half. The following tables show the results, taking the results of No. 15 as 100 per cent.:

	Train No. 15.	Special train.
Speed, miles per hour	100 per cent.	50.7 per cent.
Drawbar pull, per ton	100 "	46.5 "
Water, per ton-mile	100 "	68 "
Coal, per ton-mile	100 "	54.5 "

In general, therefore, we may say that these tests indicate the cost for power as represented by the consumption of coal and water, of running trains, increases directly as the speed, that is, if we double the speed, the coal, water and drawbar pull are likewise doubled.

I give below a table giving the coal burned per square foot of grate area per hour:

Trip. No.	Grate surface, square feet.	Actual running time, hours, min.	Coal, pounds.	Pounds of coal per square foot of grate area, per hour.	Average.
Engine 1,590, Train No. 15.					
1	37.5	3.32	13,205	99.5	....
2	37.5	3.25	12,400	96.7	....
3	37.5	3.27	12,464	99.0	98.4
Engine 1,121, Special Train.					
4	17.25	6.39	6,228	54.4	....
5	17.25	7.00	6,070	50.3	52.33

RELATIVE MERITS OF CAST IRON AND STEEL TIRED WHEELS.

Committee—J. N. Barr, A. M. Waitt, A. L. Humphrey, H. S. Hayward, John Hickey.

Since the date of the last report of this committee there have been practically no new developments or new information obtained bearing on this subject. The committee has nothing, therefore, of value to present.

Since the last report of this committee, the question has been raised as to the expediency of the use of steel tired wheels under 100,000-lb. cars, but the data in this matter is so deficient that it cannot be properly made a subject of report.

SUBJECTS.

FOR INVESTIGATION DURING THE YEAR.

Committee—W. H. Marshall, S. M. Vauclain, A. J. Pitkin.

1. Standard specifications for locomotive driving and truck axles.
2. The purifying of feed-waters for locomotives.
3. What constitutes a good locomotive terminal?
4. The gas engine in railroad work.
5. Water scoops and track troughs.
6. Review of recent progress in locomotive designs, including boilers, wheel arrangements, cylinders and valve design, frames and machinery.
7. Locomotive boilers. The Vanderbilt boiler, wide fire box, and how much grate area is desirable to obtain the best results from soft coal.
8. Piston valves.
9. Standard pipe fittings.
10. Revision of standards of the association, more particularly specifications for materials.

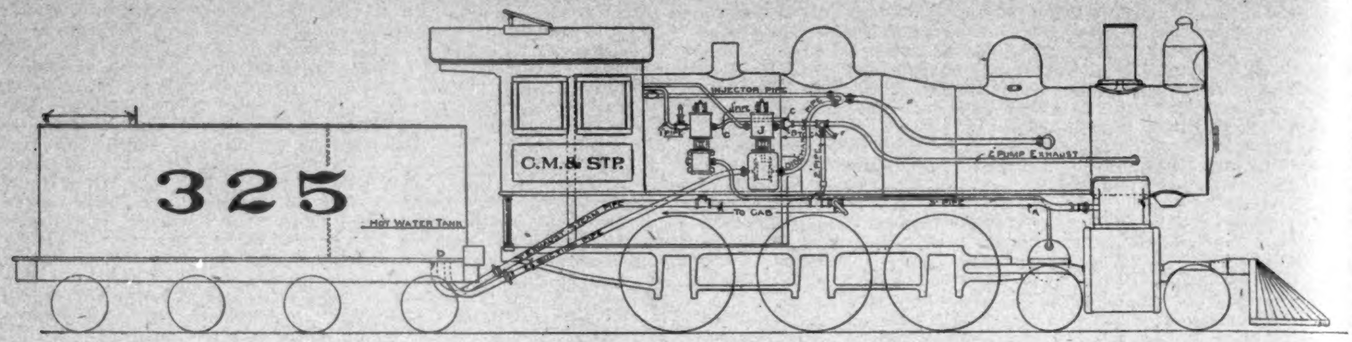


Fig. 1.—General Arrangement of Feed Water Heater.

WHAT IS THE MOST PROMISING DIRECTION IN WHICH TO EFFECT A REDUCTION IN LOCOMOTIVE FUEL CONSUMPTION?

Committee—A. E. Manchester, A. Forsyth, A. F. Stewart.

A few weeks since, in a paper and a discussion upon it before one of the Railway Clubs, in answer to a question as to the increase in the proportion of compound engines built at their works last year, as compared with four or five years previous, a prominent locomotive builder said: "After eliminating from the total number of locomotives built in our shops last year, foreign locomotives, switch engines, electric and compressed air locomotives, and various other specialties which we build, of the road engines turned out for this country seventy per cent. were compound."

Since having this subject under consideration, in conversation with another of the principal locomotive builders, he said in answer to the same question, that fifty per cent. of the road engines for this country turned out of their shops within the last year were compound.

In view of this, and from the fact that compound engines have been a topical subject of discussion at every convention for several years, and a special subject for consideration by one committee which gave a very thorough and complete report upon it, it seems to your committee that compounding has passed the questionable or experimental stage and is now so generally recognized as one of the known methods for effecting a reduction in locomotive fuel consumption as to not warrant making it a special feature of this report.

The committee is further of the opinion that the American Railway Master Mechanics' Association has so often had this matter under consideration and investigation, and such a large portion of the members have had actual experience in the operation of compound locomotives, that the Association should be prepared, and ought to, in justice to itself, give its approval or condemnation of the compound locomotive, and place itself squarely before the world as to why it does so.

In considering the advisability of the application of the compound principle to existing single expansion engines, as one of the essential features in obtaining results from compounding is high pressure steam, and as a majority of the older single expansion engines are not provided with boilers suitable for high pressures, it is doubtful whether economy would result in changing from single expansion to compound except in engines where the boilers are capable of sustaining at least 175 lbs. pressure per square inch, and a higher pressure is desirable.

If further economy by steam expansion and multiplying of cylinders be considered, it would seem proper to follow the lines suggested by a prominent engineer, who, while prophesying on the probable twentieth century improvements in locomotives, said, "We may all live to see triple, and even quadruple expansion locomotives, almost noiselessly performing their work." This may be a hint to this Association to assist in the early development along these lines, and hastening the day of further economies by appointing a committee to investigate and report on the same.

Using the exhaust steam from air pump and cylinder for heating feed water, your committee looks upon as being one of the most promising directions in which to effect a reduction in locomotive fuel consumption. This feature can be applied to existing engines, as well as new, with a moderate expense and but slight changes in existing arrangements, and is adapted to work in connection with several other fuel economizing devices, such as wide fire boxes, compounding, etc.

The average yearly temperature of water as delivered to locomotive tenders is from 50 to 60 degrees Fahr. For every 12 degrees that the temperature of the feed water is raised by exhaust steam or waste gases before the water enters the boiler, there will be a saving of one per cent. in fuel. If by the means recommended an average temperature of 200 degrees for the feed water can be maintained, a saving of twelve per cent. in fuel would result.

The method we recommend for accomplishing this is illustrated in Figs. 1 and 2, and consists of a steam pump adapted to handle hot water. The exhaust from the air pump, water pump, and a branch from the exhaust in front end, to be discharged into a partition of portion of tank, which we will designate as the hot-water tank.

The hot-water tank will have a capacity of 300 to 400 gallons of water. The partition will be water-tight, with the exception of a ½ inch space at the bottom, through which the water will maintain a constant level on both sides of the partition.

The exhaust from the cylinder saddles is conducted to the rear of the engine through a pipe, as shown in Fig. 1 at A; and the exhaust from the water and air pumps, as shown at B and C, joins this piping, which enters the bottom of the hot-water tank at D, and is then conducted up through the tank to the top and through a return bend back to within two inches of the bottom of the tank, where it terminates in a bell-shaped open end through which the exhaust escapes into the water.

In the exhaust pipe and between the pumps and cylinders is placed a shut-off gate at E, to close the exhaust from the cylinders to the tank if desired; also a gate at F where the pump exhausts may be cut off from the tank and delivered to the front end.

The suction pipe for water pump is arranged to draw water

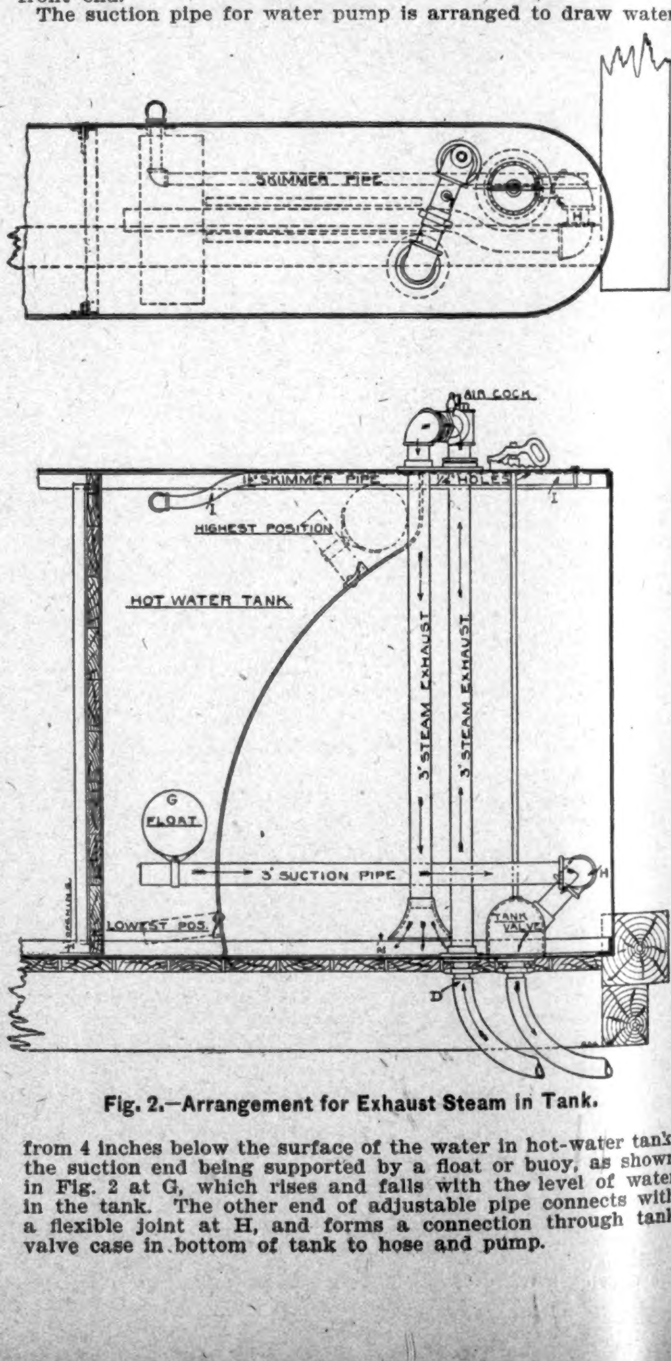


Fig. 2.—Arrangement for Exhaust Steam in Tank.

from 4 inches below the surface of the water in hot-water tank, the suction end being supported by a float or buoy, as shown in Fig. 2 at G, which rises and falls with the level of water in the tank. The other end of adjustable pipe connects with a flexible joint at H, and forms a connection through tank valve case in bottom of tank to hose and pump.

In the top of the hot-water tank is a perforated pipe, I, which connects to the pipe running down through the coal space to the under side of tender frame. When the tank is full of water, this pipe acts as a skimmer.

The most effective way to reduce the third loss would be by the use of larger grate areas, which would afford a freer air supply and from the reduction of the resistance of the fuel bed there would be a lower suction over the fire, consequently less small fuel would be carried out with the gases. Careful manipulation of the fire with small grates will have an influence in the same direction, because the resistance through the fire would be reduced.

We cannot recommend any special device except larger grates, which, of course, would apply to new engines only; although there is an opportunity of improvement with very large engines with small grates where the necessary resistance through the fire is abnormal, or where it is impossible to get sufficient air into the fire with prevailing practice. The remedy would be to introduce air over the fire. This is not recommended, however, unless shown necessary by tests of the combustion, and its application and operation determined likewise.

Complete combustion with 12 or 13 CO_2 may be secured in locomotives, and under these conditions, the loss in hot gases, based on their escaping at 800 degrees Fahr. would be about twenty-four per cent. Under such conditions, in stationary practice, an economizer would afford means for recovery of about ten or eleven per cent., but for several reasons such means are not applicable to locomotives. The usual locomotive as compared with the average stationary boiler and furnace furnishes an opportunity for a more efficient condition of combustion, but it has the disadvantages of a somewhat higher temperature of escaping gases, a very much greater loss in the form of solid fuel, and a very much greater radiation loss from the boiler.

The above remarks concerning excess of air do not apply to engines with extremely large grates, because with them the loss on this account may be considerable.

Improvement based on tests of the combustion products are always of importance, and there is no difficulty in demonstrating the value of such tests.

We are not prepared to recommend a definite proportion of grate to cylinder or heating surface, or the relative width to length; neither do we believe that such proportions can be correctly given and have them apply to all grades of fuel and classes of service. However, from information received from those who have had the most experience with wide fire-boxes and increased grate area, and from reports of combustion tests showing the gas analyses of different sized grates and fireboxes, we feel warranted in placing this feature among the methods by which some improvement in fuel economy may be effected, but all the conditions should be carefully considered before a radical departure is made from the deep and narrow box.

An uneconomical feature of the large firebox and increased grate area is the heating of unnecessary excess of air in the gases. This can be kept down to a minimum by careful firing and well-fitting ash pans and dampers, if the latter be carefully manipulated. Adjustable grates, whereby the air space could be enlarged or decreased at will, might, if such a device could be made entirely reliable, better perform this part, but we know of no grate that has withstood the test of service that will fill the requirements.

Another feature is the greater amount of coal that must be burned on a large grate while the engine is standing still and the greater care required to hold the steam below the popping-off point. The safety valve, if allowed to frequently perform its function, will be very wasteful of coal. This loss has been figured out as equal to 4 lbs. of coal per second, or a small scoopful per minute.

Wide fireboxes when operating under favorable conditions and burning fuel suitable to their construction, will develop economies worthy of consideration; but in a service where much of the time is spent standing still and the fire being kept in a condition to go whenever the signal is given, enough fuel will be wasted while standing still to overcome the economies obtained while running.

Traveling engineers and firemen; light and intermittent firing; keeping a level fire; prevent excess of air in gases; perfect combustion; checking coal consumption each trip, and constant attention to details, are some of the recommendations of members as the most promising directions in which to effect a reduction in locomotive fuel consumption.

If it be possible to stimulate in the engine crew efforts equal to those obtained in a test, it will be one of the promising directions in which to effect a saving in the fuel burned in the locomotive. Assigning regular crews to engines has the effect of stimulating an interest in the work and exciting a rivalry between the men in the same class of service on different engines that must result in economy. The remark is sometimes heard that "enginemen don't own their engines any more." Would it not be to the interest of the railroad companies to revive that old-time love for the engine which formerly existed in every engine crew?

Conclusions.

After considering the several recommendations, the conclusions arrived at by your committee are that the most promising directions in which to effect a reduction in locomotive fuel consumption must be largely determined by each particular railroad for itself, the methods varying to suit the local conditions, such as class of power, fuel, service, and to what extent fuel economizing features are now successfully employed.

Many of the recommended methods are applicable only to new construction, but engines building to-day should be serviceable for twenty to twenty-five years to come, and care should be taken to incorporate in them all well developed features of economy.

As far as we have been able to learn, a reduction in fuel consumption has resulted from compounding whenever the engines were intelligently handled. This feature seems to us to be one of the most promising directions and the one that would yield the largest per cent. of saving.

Wide firebox and increased grate area under certain conditions, with the size of the firebox and grate area modified to suit the conditions, when intelligently handled, should be one of the means of effecting a reduction in locomotive fuel consumption and should be carefully considered for new road locomotives.

As to economical length for locomotive flues, we have no definite recommendation to offer; but would call attention to some of the latest designs and constructions in which one of the new features is flues of an heretofore untried length. So far as we have been able to learn, the economical length for flues has not yet been reached.

Using of the air pump and a portion of the other exhausts for heating feed water, appears to your committee to be one of the most promising directions by which to effect a reduction in locomotive fuel consumption. It is applicable to old and new construction and to all classes of service. Your committee had hoped to present to this convention something more tangible than a picture with which to back up their recommendation, but failed in the market to locate what seemed to be a satisfactory pump for the place. In our judgment, there are no requirements which cannot be met, and assume that it is only a question of showing what is wanted, together with the volume of business this feature would open up, to have the pump manufacturers bring out what is required.

All the methods referred to are worthy of consideration. Many of them are adapted to work together, each one exerting an individual influence toward fuel economy, and when aided by earnest and intelligent effort on the part of the engineer and fireman, in connection with close attention to details on the part of the Motive Power Department officials, a reduction in locomotive fuel consumption will follow.

AN "UP-TO-DATE ROUNDHOUSE."

Committee—Robert Quayle, D. Van Alstine, V. B. Lang.

As the appurtenances of the house depend entirely upon the general dimensions, your committee has concluded that the length of the roundhouse should not be less than 80 ft. in the clear. Rapid strides have been made in the design and construction of locomotives during the last few years, and it is not infrequent for us now to find a number of engines that measure from 65 to 70 ft. over all. A locomotive 70 ft. in length would only give us 10 ft. in clearance. This being divided equally would only leave 5 ft. between each wall.

Doors should have a minimum height and minimum width of 16 ft. and 12 ft. in the clear, respectively. The upper portion of the doors should have as much light as can be obtained without interfering with the strength. The window space should be as ample as considered consistent with the strength of the walls in the outer circle of the roundhouse.

Engines should head into roundhouses of modern type, first, because of the more room afforded at the outer circle of the house, where most of the work on the engines is done when headed in in this manner; second, because of the increased light that can be obtained.

Your committee would recommend that ventilators be used at least in every other stall, with a minimum dimension of 3 by 4, and not less than 2 ft. in height, and these to have the usual slats in the sides. In the northern country we recommend that a damper or drop-door be placed in the bottom of each ventilator so that they can be closed in winter time when necessary. In the southern districts of our country, it is not considered necessary to have these additional openings where they have the continuous ventilator at the highest point of the roof, which is used instead of smoke-jacks.

The length of pit should be 60 ft.; the depth of same to be governed by the type of power used on the line for which the roundhouse is being built. For example: If engines have large fireboxes, and the wheels are from 63 ins. and upward over all, we recommend that the pits be 2 ft. 6 ins. minimum depth, and 3 ft. maximum depth. If the wheels of the locomotive are low, and most of them deep fireboxes, we would recommend that the pits be 3 ft. minimum and 3 ft. 6 ins. maximum depth.

The floor of the pits under the engines should be formed to a convex surface, the center being about three inches higher than the sides, which allows workmen to work on a dry floor even if there should be some water trickling through the sides of the pit. The floor of the pit is best made of brick on edge on a concrete bed. If this is considered too expensive, it can be made of crushed stone and sand.

The drainage of the pit is a very important feature. Many modern houses have the engine pits extend to an annular pit, which is just inside of the main doors, this pit being made lower than the engine pits. This annular pit should be drained at some suitable point into the turntable pit or system of drainage. This pit should be deeper in the center than at the sides, and besides offers an opportunity, where this is desired, for stringing water and steam pipes. This pit should have loose

covers which can be removed when necessary to clean out the pit, but ordinarily form a close floor. The turntable pit should have a tile drainage to the main sewer. It should also be either paved with vitrified brick or cemented.

An up-to-date roundhouse floor should be of vitrified brick laid on edge in a bed of sand. The consensus of opinion is that the brick floor is the best, and your committee would recommend a concrete bottom and then a layer of sand in which to bed the vitrified brick. When brick is laid, the floor should be covered with a layer of sand or tar (tar preferable) to fill in the joints.

We also recommend that the water and blow-off pipes be placed in the annular pit, all other pipes to be placed overhead, with drop-pipes between every two pits, with suitable hose connections to connect with the locomotives. The blow-off pipe from the top of the dome to be connected with short pipes through the roof over each pit, connection with the engine to be made with flexible metallic joints.

The most modern method of heating at present, seems to be by hot air and forced blast. In this connection the air can be taken from the roundhouse and warmed over and over again, thus reducing the cost of heating the air. While this air is generally carried in overhead ducts, your committee considers it should be investigated and determined in each case whether an underground duct would not be suitable. It is also suggested that air be taken from the boiler room, thus serving the double purpose of cooling this room and using the heat imparted to warm the roundhouse.

One arc light should be located over the center of the turntable, and not less than three 16-candle-power incandescent lamps should be placed between the pits; one about opposite the cylinders, another about opposite the cab, and the third about the center of the tank. There should also be located in convenient places in every other stall two connections for portable lamps for pit work and firebox work; all lamps to be covered with wire guards for protection.

Every roundhouse should be provided with a drop-pit for removing driving wheels, extending across two tracks; also one closer to the outer wall of the house for removing truck wheels. These pits should be so arranged that the wheels can be removed from an engine on one track, and run over to the adjacent track, and then lifted up to the floor. Jacks are preferably worked by power, air and water being the chief sources. The hydraulic power, however, has the advantage in that there is not the same elasticity and vibration that is noticeable when air is used.

When new tables are being put in, your committee would recommend that they be made at least seventy feet long and well braced. Experience shows that the long table with a load on it is more easily handled than the shorter table with the same load. This is no doubt due to the fact that you are better able to balance the engine, by having longer leverage. Your committee recommends electric power for operating turntables in preference to any other in use. If, however, there is no electrical power available, the gasoline engine can be used for this purpose very successfully. If the electric motor be used, a foot-brake is very desirable, as it will save trouble with the motor by the operator reversing the current in order to stop the table at the proper place. Such a brake will also allow the omission of the lock, as the table can be held securely by this means when the engine is moving on or off.

Your committee recommends as many wall benches supported by brackets as there are stalls, and in addition to these, several portable benches.

It is the opinion of your committee that every well-managed roundhouse should be provided with a tool-room for the care and maintenance of hand tools and supplies.

An annex should be provided to contain the necessary boiler, pumps and machine tools for making ordinary running repairs, as well as a room for supplies. We would recommend the following machinery, namely: One 30-in. engine lathe, one 12-in. engine lathe, one 30 by 30-in. planer, one 24-in. drill-press, one 20-in. shaper, one grindstone, one bolt-cutter, one screw or pneumatic press for rod bushings, one blacksmith forge and anvil, etc. Where size of the cylinder demands it, the large lathe should be increased to 36 ins.

We further recommend that the following portable tools be provided, namely: Portable crane, valve-facing machine, air motors, air drills and hammers, cylinder boring machine, valve setting apparatus, chain block and fall, hydraulic jacks, small air press, pinch bars, chains, tongs, wrenches, etc.

For handling ashes and cinders, we conclude that the cheapest arrangement, and one which is least liable to cause trouble by breaking down, is a depressed track between two tracks, the depressed track to be deep enough so that the ashes can be hoed from the cleaning floor directly into the ash cars, and the double ash tracks being merely for the purpose of having engines desiring quick treatment pass around those which may be a longer time on the pit. If, however, there is not sufficient track room for this arrangement, some mechanical device for taking care of the ashes will have to be resorted to, provided the traffic warrants the expense.

Considering the cost of fuel, labor and maintenance, your committee is of the opinion that the steam coil sand dryer is the most economical. On the question of furnishing sand to locomotives, the answers were almost unanimously in favor of elevated sand bins, the sand being elevated by compressed air or mechanical means, allowing the sand to flow into sand-boxes by gravity. In this your committee concurs.

For washing out locomotive boilers, your committee recommends that 100 lbs. pressure per square inch be used, and when it is desirable to do this in the shortest possible time, hot water can be used advantageously.

It is the opinion of your committee that staybolts should be tested once a month. The hammer test is satisfactory when bolts are completely broken through. When only partially broken it does not tell the story. Where tell-tale holes are drilled, or hollow staybolts used, a careful inspection of the tell-tale hole for the presence of lime is considered most satisfactory. It is also desirable that a record should be kept of all such tests. In making the hammer test, about 40 or 50 lbs. of steam or air pressure should be used in boiler to separate the ends of the broken bolts.

Your committee is of the opinion that it is very necessary that a roundhouse foreman should have had practical experience as a machinist, and that if he could have some experience as either a locomotive fireman or an engineer, it would make him a better roundhouse foreman than he could be without such experience, as he would then know the conditions that exist on the road, and could therefore do more intelligent work.

A STANDARD LOCOMOTIVE CLASSIFICATION.

An Individual Paper.

By R. P. C. Sanderson.

The appearance during the past year of a number of letters and articles in the technical press, bringing forward different plans for locomotive classification, would indicate that there is need of a generally acceptable locomotive classification, and the matter presented herewith is advanced with the idea that perhaps the suggestion contained may, if not complete, at least lead to a generally acceptable plan for locomotive classification which could be adopted by the association as standard and be used by the locomotive builders as well as railroad officers in referring to locomotives, either for descriptive purposes or when referring to tonnage or speed performances.

The time-honored plan of giving class letters to the different styles of locomotives on any one railroad, the letters following one another in alphabetical order in accordance with the dates at which the different classes evolve themselves, is familiar to all of us, and while it is, to those who are brought up and educated on the particular road on which the classification is in force, as familiar as any household word, yet to an outsider the classification does not convey any information which would enable him to tell the design, power or anything else in connection with the engine. As the numbers of classes of engines have increased on larger systems, even this method of classifying engines has been found insufficient and efforts have been made to modify the same, adding figures to the letters to provide enough subdivisions to take care of different classes and styles of engines, as the alphabet was too short for the purpose.

On railway systems which have grown by aggregation, so that the classes of engines are very numerous and were not designed by any one controlling departmental head, the conditions are often perplexing. On one road that is before the writer's mind there were as many as twenty-three different classes of 8-wheel engines with cylinders 17 inches in diameter. Happily many of these have gone to that scrap pile from which no old engine ever returns. The various classes of engines, for lack of official designation, were known as "Creepers," "Klondikes," "Broncos," "Fan Tails," "Mud Hens," "Sea Cows," "Battle Ships," etc. As a fact, some of these names were more suggestive than the letter classification would have been, as they have originated in nicknames given the engines, on account of their failings or peculiarities, by the "sandhouse meetings."

In hunting for a suitable engine classification the different schemes brought forward in the technical journals were all considered, but found too complicated, or did not appeal to those interested, for lack of descriptiveness and general usefulness. Those based on the wheel arrangement did not convey enough information to the transportation officers, and others had to be used with a key for explanations.

For an engine classification to be generally useful it should fill, in the writer's estimation, the following requirements:

1. It should give an immediate mental picture of the style of engine. 2. It should give correct information as to the power of the engine. 3. It should designate, for the benefit of the Mechanical Department, foreman and others, the particular make of engine.

To comply with the first requirement it has seemed that the initial letter of the recognized names of the different types of engines would be the best class letter to use, thus:

E for 8-wheel engines.
T for 10-wheel engines.
V for 12-wheel engines.
C for consolidation engines.
M for mogul engines.
S for switch engines.
A for Atlantic type engines.
P for prairie type engines.

With reference to the second requirement: As to-day we are all largely interested in the tonnage haul, by divisions and so on, a figure representing the power of the engine, which would indicate to any transportation officer, whether Division Superintendent, General Superintendent, and so on, the hauling capacity of that engine over any of his grades, would be the most convenient indicator to use for the size and power of the engine.

It is suggested that for this purpose we could use the hauling capacity in tons at ten miles per hour on a straight, level track, figured under formula $H = \frac{T}{R} - W$, where "T" equals tractive force in pounds, figured by the usual formula on a basis of eighty per cent. of boiler pressure as mean effective pressure; "R" representing 5.25 lbs., equal to the speed resistance per ton, and "W" the weight of the engine and tender in tons. This would figure out anywhere from say 2,400 tons to 7,500 or 8,000 tons, ranging from a 17-in. cylinder to a 22-in. cylinder.

As these figures will be too long for current use, and as minute refinement is unnecessary, it is believed that the first two figures, representing hundreds, would be sufficient, so that an engine classed as "T 37" would represent a 10-wheel engine of 3,700 tons hauling capacity on a straight, level track at ten miles an hour.

This would give the transportation officers all the information they would require with regard to any engine that would appear on their divisions. They would need in addition a rating sheet for each division showing—at the speeds at which the trains would have to be handled, and making allowance for all the difficulties of the division, water stops, grade stope, compensation for curvature, etc.—what the actual tonnage rating should be summer and winter for each tonnage class as given in these figures.

The mechanical department officers, however, will have to have further knowledge of the engine in that there might be several different patterns of engines of the same type and tonnage class. There might be, for instance, three or four styles of engines T 37. This can be very readily provided for by using a small letter affix to follow the tonnage rating, as "T 37 a," and "T 37 b," and so on, representing different builds and makes of engines of the same tonnage class and type.

With regard to switch engines, they are not usually figured on the basis of tonnage rating. As some further knowledge of the engines is desirable, it is therefore believed that the switch engines can be classified in the following manner, to convey a better impression of the style and class of engine:

S 4, 4-wheel coupled switch engine, no truck.
S 6, 6-wheel coupled switch engine, no truck.
S 8, 8-wheel coupled switch engine, no truck.
S T, 10-wheel switch engine.
S C, consolidation switch engine.
S M, mogul switch engine.

The small final letter following would ordinarily be sufficient information as to the style and build of the engine for full identification. For instance, "S 6 b."

There is one point left uncovered in this classification which the writer was not able to scheme out in the time allotted for the work and which to some may seem to be very necessary, namely, a distinction between high-wheel passenger engines and low-wheel freight engines of the same type. This would be indicated, of course, in the tonnage capacity, and the officers of any one road would soon become familiar with their engines and not need this special classification between passenger and freight. It is also rather a difficult matter to draw the line between passenger and freight on many roads, as on low-grade roads heavy passenger trains are hauled with the same sized driving wheel as fast freight trains. It might be that the use of the capital letter or a small letter would be inappropriate to designate a recognized passenger engine from a freight engine, or a different grouping of the figures on the badge could be arranged to indicate these, but this would only be clear to those seeing the emblem on the badge and could not well be conveyed by word of mouth without additional elaboration.

There is another point which will no doubt occur to some has not been properly covered, namely, that many engines of equal cylinder power may be short of heating surface and boiler capacity so that they cannot properly exert their full cylinder power. Such engines should be rated lower than other engines of equal cylinder capacity with full boiler capacity. This, of course, is a matter that can be best handled by having actual tonnage tests made of the engine, after the theoretical rating is established, and correcting the classification according to the results thus obtained.

The above, generally speaking, is the result of an effort made to apply some systematic classification to a very miscellaneous assortment of locomotives, but it has led to the thought that the idea could be developed further and applied to locomotive classification generally with advantage to all concerned.

ADVISABILITY OF THIS ASSOCIATION JOINING THE INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.

Committee—S. M. Vauclain, H. S. Hayward, T. W. Gentry.

The object of the International Association for Testing Materials is the development and unification of standard methods of tests, for the determination of those qualities of materials of construction and others which are of technological importance, and the perfection of apparatus used for that purpose.

At the instigation of John Bauchinger, director of the testing laboratory of the Technical School at Munich, formal conferences were held at Munich in 1882, Dresden in 1884, Berlin in 1886, Munich in 1888 and at Vienna in 1893, at which the above questions were discussed. The reports of these proceedings attracted wide attention, and, as a result, the International Association for Testing Materials was formally organized at a conference at Zurich, both the United States Government and the American Society of Mechanical Engineers being represented by delegates. In 1897, the second congress of the Association was held at Stockholm, at which eighteen countries were represented, the United States Government by an army and a navy officer, and the American Society of Mechanical Engineers was also represented.

The Association is working chiefly through committees, and to show the scope of the work the following is the list of subjects upon which the various committees are to render report at the next congress, in 1902:

Problem 1.—To establish international rules and specifications for testing and inspecting iron and steel.

Problem 2.—To establish methods of inspection and testing for determining the uniformity of individual shipments of iron and steel.

Problem 3.—On the properties of soft steel (Flusseisen) at abnormally low temperatures.

Problem 4.—Methods for testing welds and weldability.

Problem 5.—Collection of data for establishing standard rules for piece tests, with special reference to axles, tires, springs, pipes, etc.

Problem 6.—On the most practical methods for polishing and etching for the microscopic study of iron and steel.

Problems 7 to 16.—Relate to natural and artificial building stones and their cements.

Problem 17.—On methods for testing tile pipes.

Problem 18.—On methods for testing the protective power of paints used on metallic structures.

Problem 19.—On uniform methods for testing lubricants.

Problem 20.—On the protection of wood against action of dry rot.

Problem 21.—On the revision of the statutes.

Problem 22.—Considering that the resolutions formed by the International Congresses of Munich, Dresden, Berlin, Vienna and Zurich for the purpose of obtaining unity in the methods of testing materials do not agree in many points with the decisions arrived at by the French commission, it is proposed that the managing committee appoint a commission which shall prepare a report upon these differences, and proposals for ways and means to abolish them.

Problem 23.—On uniform methods for compression tests of wood.

It is also proposed to establish an international chemical laboratory at Zurich, and a committee was appointed to organize the same. The American members are Dr. Dudley, Chemist, Pennsylvania Railroad, and Professor Howe, Professor of Metallurgy, Columbia College.

The members of the council are appointed by the International Congress. The first American member was Capt. Oberlin M. Carter, the second was Mr. Gus C. Henning, and last October the present member, Prof. H. M. Howe was unanimously elected by letter ballot as the Member of the Council.

The membership of the American Section includes all of the large steel companies and representatives from the test departments of a number of railroads. The following techincal associations are also members:

American Foundrymen's Association; American Society of Mechanical Engineers; Franklin Institute; Technischer Verein.

The most work has been accomplished by Committee No. 1, of which Mr. W. R. Webster is chairman. This committee has formulated a set of specifications for the following material:

Bridge and Ship Material; Building Material; Rails; Boiler and Firebox Plate; Axles—driving and truck; Tires; Forgings; Steel Castings; Wire.

Specifications devoted exclusively to locomotive forgings, and for spring steel and boiler tubes will be in shape this spring.

We believe more good would result from the Master Mechanics' Association urging their specialists on testing of material to join the International Association individually or as representatives of the railroads than could be obtained by the Master Mechanics' Association joining as a body. It may also be advisable to recommend the appointment of a committee to co-operate with Committee No. 1 in the formulation of standard specifications applicable to material used in railroad work. The specifications recommended by this committee are to be discussed by the American Society of Mechanical Engineers, American Society of Civil Engineers, American Institute of Mining Engineers, the former having appointed a Committee on Tests and Method of Testing Material with which Committee No. 1 proposes to co-operate. The specifications will also be thoroughly discussed abroad and they no doubt will represent the best thought of engineers on this subject.

Your committee therefore recommends:

First: That this Association should not join the International Association until a more definite organization is effected. Second: That a committee of material experts, members of this Association, be appointed to consult with the International Council (American Section) if it desires our assistance. Third: That it would be far better for this Association to adopt the specifications agreed upon by the International Council, if a majority of our members would endorse the same, instead of becoming members of the International Council, thus leaving our Association free to depart from them at any time a majority vote would favor doing so.

(*Concluded next month.*)

MASTER CAR BUILDERS' ASSOCIATION.

Thirty-Fifth Annual Convention.

Abstracts of Reports.

TRIPLE VALVE TESTS.

Committee—G. W. Rhodes, A. W. Gibbs, W. S. Morris, J. O. Pattee, W. McIntosh.

During the year an air brake valve known as the "Hibbard" has been submitted to your committee for test purposes on the Association's rack at Purdue University, La Fayette, Ind. This valve is owned by Chicago interests. Fifty valves were delivered to the committee at the University, applied to the rack and made ready for test, those interested in the device having first been given an opportunity to thoroughly prove the device themselves, making such readjustments as seemed advisable. A description of the Hibbard air brake valve is as follows:

Fig. 1 shows the valve in section. The train pipe air entering the valve passes through the strainer and upward through the passage 27 in the end cap and into chambers 3 and 4 and feeds to the reservoir through the by-pass 5, the route being shown in dotted lines. The piston 8 has a single traverse and governs the release of the brake cylinder through passage 12 and by means of slide valve 9. The piston 13 has a stem 14 on whose inner end is the graduating valve 16 governing the passage 17 through the emergency valve 18. This passage communicates with the brake cylinder.

In service action both pistons move to the left, piston 8 making its full traverse, thereby closing the release port, and piston 13 lifting the service valve 16 from its seat and permitting the reservoir air to flow to the brake cylinder. The route of the air is shown by the line marked S. When the reservoir pressure is reduced slightly below the train pipe pressure, the piston 13 seats the service valve 16. In emergency action, pistons 8 and 13 both make full traverse. The annual ring 15 on stem 14 will abut the split collar 21, thereby closing the service route of the air, and will lift emergency valve 18 from its seat, venting the train pipe air through the strainer, past check valve 24, through passage 23, and thence direct to the brake cylinder. The route of the air is shown by line marked E. The reservoir air flows around the outside of the emergency valve 18, through bushing 20, meeting the train line air, and then enters the brake cylinder. A restoration of the train pipe pressure returns all the parts to their normal position and releases the brakes.

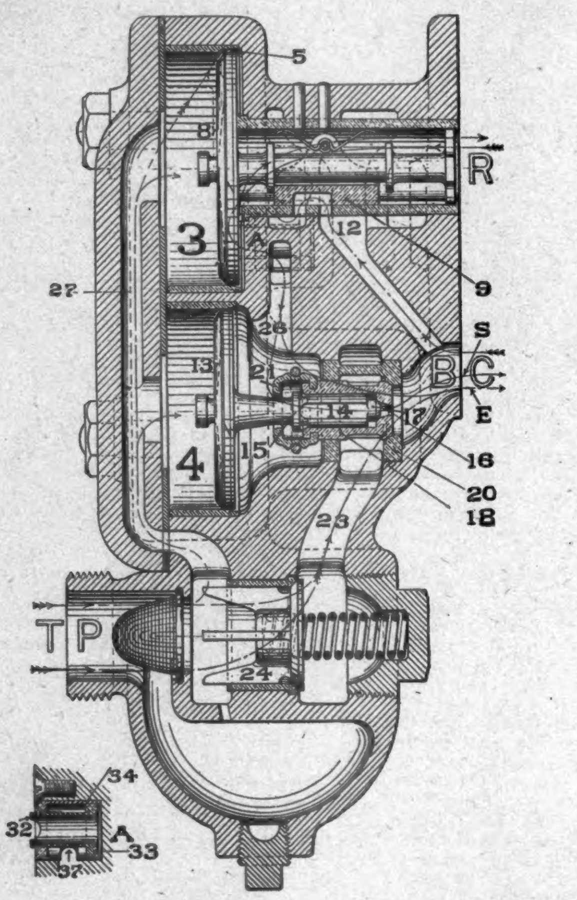


Fig. 1.

The part marked A is fixed in the passage 26 by means of the bushing 34, which has an opening 37 on its lower side. The tube 32 operates in the bushing and has an annular ring 33 on its inner end, the bushing and the tube making a partially air-tight closure of passage 26. The operation of these parts is as follows: When the piston 13 has opened the service valve 16, the pressure in the annular space in the bushing 34 around the tube 32 will be less than the reservoir pressure on the annular ring 33 on the tube 32, and will move the tube to the left until the ring 33 passes opening 37 in the bushing, thereby forming a direct communication from the chamber 3, on the inner side of the piston 8, to chamber 4, on the inner side of piston 13.

The function of the device A is as follows: Piston 8 and 13 being independent of each other in their movements, if the piston 8 should by any possibility stick and fail to move, and the piston 13 should move, the reservoir air would flow to the brake cylinder and to the atmosphere in case such device was not used. This device, however, prevents such action by holding the reservoir air in chamber 3 until piston 8 moves and closes the release passage. The tube 32 abuts piston 8 and cannot open the passage 26 until piston 8 has moved. This part A is not essential, as the piston 8, having a larger area than piston 13, will move first, but is used only as a matter of precaution in case piston 8 should by any possibility stick and fail to move.

Some of the claims set forth by those interested in the Hibbard valve are:

1. The slide valve having only one traverse wears the seat uniformly, thereby preventing the blow or leakage incident to the two-traverse valves when making their full traverse.
2. The area of the piston which moves the emergency valve is so proportioned to such valve that emergency action is produced only when the proper reduction is made, thereby obviating the trouble of getting too early emergency action which occurs in those valves that depend on a graduating spring.
3. The absence of springs.
4. The emergency valve, being a metallic valve, is not dissolved or affected by oil.
5. The strainer's apex is pointed against the current of air and arrests and deflects dirt, dust, etc., into a dirt chamber where the dirt is trapped out of the path of the air, and so remains until removed.
6. The simple removal of a single cap permits access to all the working parts for cleaning, oiling or overhauling.
7. The valve is from 7 to 13 lbs. lighter than those in common use.
8. Less temptation to brass thieves because the brass parts are fewer and lighter than those in general use.
9. Simplicity in construction and operation, rendering the valve comparatively inexpensive of manufacture and easily understood by operatives.

The committee offers no comments on these claims, the owners are likely to be partial to their own device, and each member of the Association can draw his own conclusions.

The Association's test plant was fully described and illustrated in the annual Proceedings of 1893. It will not be necessary to repeat the description, as there has been no material change in it. The plant was originally located at Altoona, Pa., at the shops of the Pennsylvania Railroad. During the summer of 1898 the apparatus was transferred to La Fayette, Ind., Purdue University becoming its custodian. In 1894 a series of tests with various triple valves then on the market were conducted at Altoona, the results appearing in the annual report of that year. The immediate effect of these tests was the framing of a code descriptive of what was considered essential performances in air brake valves for freight cars. This code was presented to the Association at its Alexandria Bay convention in 1895, and subsequently adopted as recommended practice.

A summary of the tests of the Hibbard valve is as follows:

Test No. 1.	To determine power of service brake	Meets requirements.
Test No. 2.	Development of power and measurement of time in emergency service.	Fails in the 55 lbs. pressure requirement in 3½ seconds by .196 of a second in the first series of three tests, and by .076 of a second in the second series of three tests.
Test No. 3.	Jumping Test	Meets requirements as far as jumping is concerned, but fails in the time requirement on the 50th car.
Test No. 4.	(a) Graduating Test	Meets requirement.
Test No. 4.	(b) Graduating Test	Meets requirement.
Test No. 5.	Disk Test—Service	Meets requirement.
Test No. 6.	Disk Test—Emergency	Failed in requirement.
Test No. 7.	Holding Test—Service.	Meets requirement.
Test No. 8.	Release Test	Meets requirement.
Test No. 9.	Time Charging Reservoir	Failed in requirement.
Test No. 10.	Service followed by quick action	Meets requirements as far as quick action is concerned, but failed in the time requirement.
Test No. 11.	A Extra—Mixed Train Test of Application No. 1	Results entirely satisfactory.
Test No. 11.	B Extra—Mixed Train Test of Application No. 2	Results entirely satisfactory, including time requirement.

Conclusions.

It will be observed that while, under a strict accounting, the Hibbard valve failed in four of the twelve tests it was subjected to, there was but one class of failure, excluding the

minor test of time charging reservoir to 70 lbs., namely, the time record, and that in the No. 2 test this failure only amounted to a small fraction of a second, so small indeed that it had to be measured by electrical recording apparatus, the combination of stop watch, gauge and observer's eye not being quick enough to determine the differences. The advantages of the disc test for measuring the range of service application and the range of emergency application was well illustrated. No. 6 test was a surprise and disappointment to all those who had witnessed the fine performance of the valve in all other respects. The inventors of the valve feel confident they can reproportion the parts so that emergency action will follow service action within the 3-64 limit called for in test No. 6. When this is accomplished it is believed that the Hibbard valve will easily meet all the requirements of the Association's code. The committee feels that it cannot commend too highly the action of the owners of the Hibbard valve in submitting their device for criticism and test before putting them on the freight cars of the country.

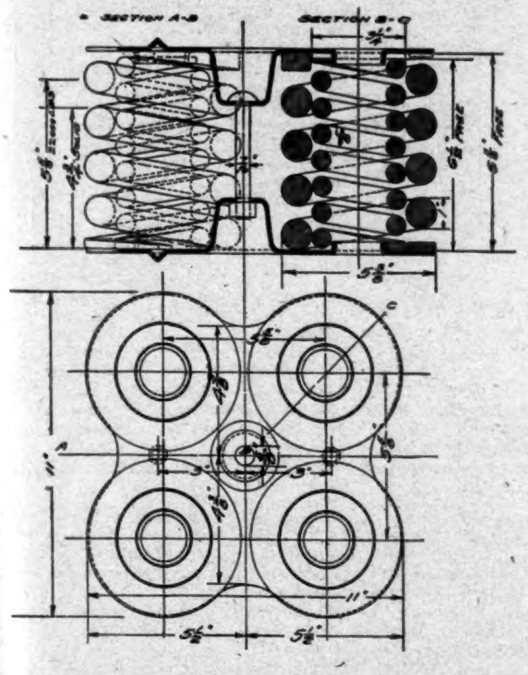
REVISION OF RECOMMENDED PRACTICE FOR SPRINGS, INCLUDING DESIGN FOR SPRINGS FOR 100,000-POUND CARS.

Committee—C. Linstrom, A. G. Steinbrenner, R. P. C. Sanderson.

Your committee, to which was assigned the above subject, wishes to report that after having carefully gone over the specifications of the present recommended practice, it was found that it would be necessary to make a complete revision of the springs. A revision, however, in order to be of any value, and to have a chance of being adopted by a majority of the roads, must conform as closely as possible to present practices, regardless, perhaps, of ideal conditions.

The trouble with the present recommended practice for springs has been due principally to a lack of sufficient material

SPRING "A" 60000 LBS CARS (ARCH BAR TRUCKS)



EIGHT BARS, FOUR BARS 1" DIA 63½" LONG TAPERED TO 72½"
" " ⅝ " 62½" " " 66¼"
NORMAL WT OF EACH 1ST FOUR BARS 16 LBS 12 OZ, MINIMUM WT 16 LBS, 5 OZ.
" " " " 2ND " 5 " 6 " " " 5 " 3 "
OUTSIDE DIAM 1ST FOUR COILS 5⅛" 2ND FOUR COILS 3¼"
HEIGHTS 1ST FOUR COILS 6⅛" FREE; 4¾" SOLID; 5⅛" 3370 LBS, CAP'Y 7440 LBS
" 2ND " 6⅛" " 4¾" " 5⅛" 1530 " " 3060 "
CLUSTER OF SPRINGS
HEIGHTS EXCLUSIVE OF CAPS 6⅛" FREE; 4¾" SOLID; 5⅛" 28000 LBS; CAP'Y 42000 LBS.

and to specifying loads to be carried beyond the endurance of any known spring steel. The question of properly designing helical springs is not a difficult matter, though somewhat tedious, and requires carefulness. There are three conditions which govern the amount of material that should be used.

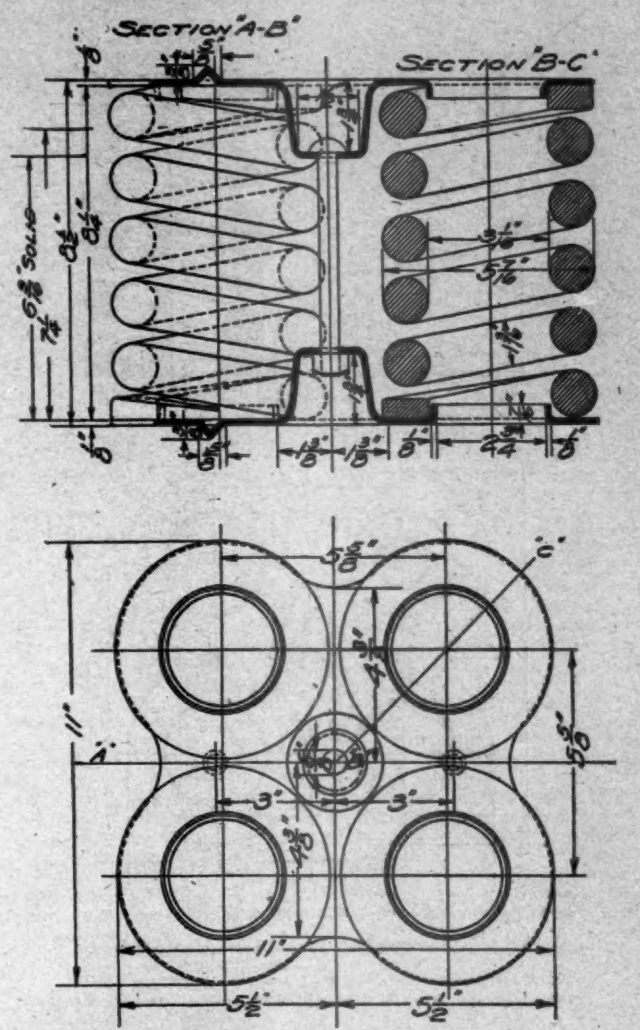
First. Maximum allowable stress in the material.

Second. Total capacity when solid.

Third. Deflection from free to solid height.

Experience has demonstrated that with the usual quality of spring steel the best results are obtained when the maximum stress does not greatly exceed 80,000 lbs. per square inch in the outside fibers of the material, as under these conditions the material will not become fatigued, lose its elasticity and take permanent sets or break from repeated applications of the maximum load. Good results are, however, obtained with a

SPRING "B" 70000 LBS CARS (ARCH BAR TRUCKS)



4 BARS, 1⅜" DIA, 73¾" LONG TAPERED TO 60⅛".
NORMAL WT OF EACH BAR 23 LBS; MINIMUM WT 22 LBS 5 OZ.
OUT-SIDE DIAM 5⁷⁄₁₆"
HEIGHTS 8¼" FREE; 6⁹⁄₁₆" SOLID; 7¼" 7400 LBS; CAP'Y 12500 LBS.

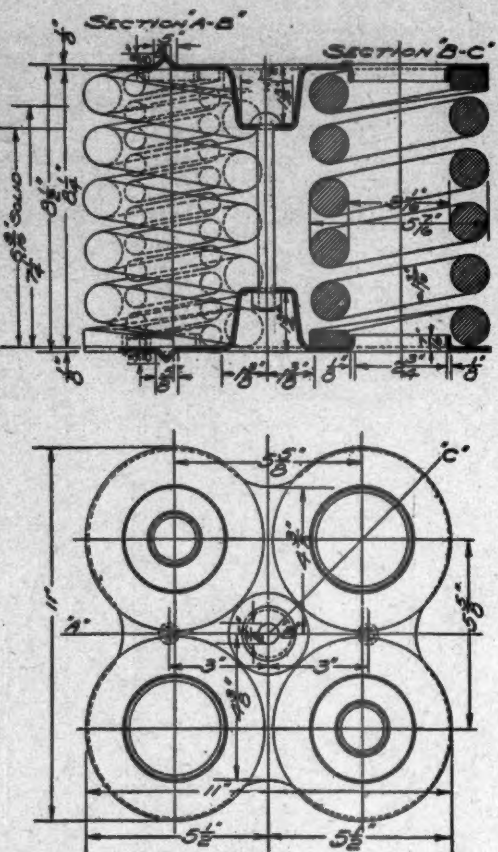
CLUSTER OF SPRINGS
HEIGHTS 8¼" FREE; 6⁹⁄₁₆" SOLID; 7¼" 29000 LBS; CAP'Y 50000 LBS.

maximum stress of 85,000 lbs., but when the stress exceeds this figure the endurance of the spring is greatly endangered, unless the steel is of a very superior quality.

With the stress in the material established, the weight of the springs depends entirely upon the requirements as to total capacity, and total deflection, regardless as to the details of construction as far as relates to ordinary car springs. It is therefore quite immaterial if the requirements demand a spring composed of a single coil or of a number of coils; the weight of the steel in either case will be the same. If this principle is thoroughly understood, one of the points which has perhaps caused a greater amount of contention between parties favoring particular construction of springs as against others, on account of supposed saving in material, will have been removed. The prevailing practice in regard to the total capacity when solid and the total deflection—that is, the difference between free and solid heights—has generally been that the total capacity should be about twice the capacity required under the loaded car, and that the deflection should be between 1¾ and 2 ins., and these conditions have been allowed to govern in the design of the revised springs. While a larger deflection would sometimes be desirable on account of easier motion, the small available space in the trucks as well as increased cost has made it prohibitory.

Before deciding upon the springs as now submitted, the various spring specifications which were received in reply to the circular of inquiry were carefully gone over so as to ascertain if any of these springs fulfil all the requirements, and while some of the springs are very close to what would be desired, only a few were found to be correct, and these have been included in the revision. The majority, however, were found to be short in material, and consequently to have stresses too high for good practice, and these designs could not be recommended for adoption. In the preparation of the new springs the following conditions may be noted:

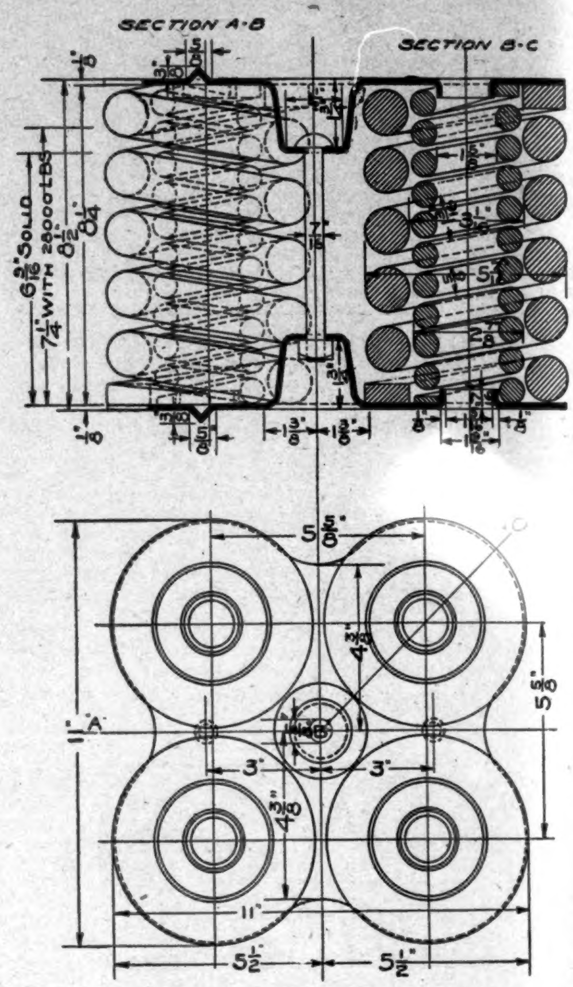
SPRING "C" 80000 LBS CARS (ARCH BAR TRUCKS)



6 BARS.
4 BARS 1⅛" DIA., 73¾" LONG, TAPERED TO 80⅝"
2 " ⅝" " 74¼" " " " 77¾"
NORMAL WT OF EACH 1ST FOUR BARS 23 LBS; MINIMUM WT 22 LBS 5 OZ.
" " " " 2ND TWO " 6 " 7 OZ " " 6 " 4 "
OUT-SIDE DIAM. OF 1ST FOUR COILS 5 7/16"; 2ND TWO COILS 2⅞"
HEIGHTS, 1ST FOUR COILS 8¼" FREE; 6 9/16" SOLID; 7¼" 7400 LBS, CAPY 12500 LBS.
" 2ND TWO " " " " " " 2100 " " 3500 "

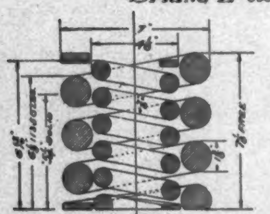
CLUSTER OF 6 SPRINGS
HEIGHTS WITHOUT CAPS 8¼" FREE; 6 9/16" SOLID; 7¼" 33800 LBS; CAPY 57000 LBS.

SPRING "D" 100000 LBS CARS (ARCH BAR TRUCKS)

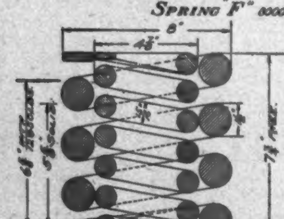


EIGHT BARS 4 BARS 1 3/16" DIA., 73¾" LONG, TAPERED TO 80⅝"
4 " ⅝" " 74¼" " " " 77¾"
NORMAL WT OF EACH 1ST FOUR BARS 23 LBS; MINIMUM WT 22 LBS 5 OZ
" " " " 2ND " " 6 LBS 7 OZ " " 6 " 4 "
OUTSIDE DIAM OF 1ST FOUR COILS 5 7/16"; 2ND FOUR 2⅞"
HEIGHT 1ST FOUR COILS 8¼" FREE; 6 9/16" SOLID; 7¼" 7400 LBS CAPY 12500 LBS.
" 2ND " " " " " " 2100 " " 3500 "
CLUSTER OF SPRINGS
HEIGHTS WITHOUT CAPS 8¼" FREE; 6 9/16" SOLID; 7¼" 38000 LBS; CAPY 64000 LBS.

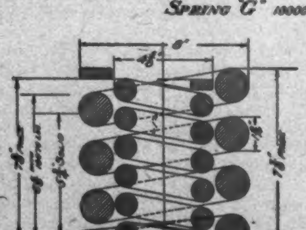
SPRING "E" 60000 LBS CARS (PEDESTAL TRUCKS)



SPRING "F" 80000 LBS CARS (PEDESTAL TRUCKS)



SPRING "G" 100000 LBS CARS (PEDESTAL TRUCKS)



First. Each complete cluster of springs has been considered as a unit, regardless of the number of individ al coils contained in each cluster; this method of classifyin, the springs it is thought will cause less confusion than to classify every separate coil as in the present recommendation.

Second. Wherever possible the springs for the lighter cars are constructed of bars similar to those used for the heaviest cars by removing some or all of the interior coils; thus, for instance, spring "B" for 70,000-lb. cars with arch bar trucks consists of four coils similar to the outside coils of spring "D," and spring "C" consists of four outside coils and of two inner coils of same dimensions as for class "D." While this arrangement of springs does not give the exact height with loaded cars as would be the case if each class of spring was especially designed for the class of car for which it is intended, the difference is so slight that it has no practical influence.

Third. The stress in the steel has been calculated to be as nearly uniform in all the bars when solid as practical dimensions will permit, and has been confined within the limits of 80,000 and 85,000 lbs. per square inch, except in the springs for 100,000-lb. pedestal trucks, in which the limit has been exceeded on account of the impossibility of designing a satisfactory spring with a lower stress in the available space.

Fourth. In order to obtain the required capacities in double coil springs it has been necessary to make the inner coils in some of the springs of heavier steel than would be consistent with the diameter of these coils when compared with the outer coils. The increase in stress in material which would naturally result from such construction has been overcome by reducing the free height of the inner coils to dimensions corresponding to the large bars used, so that the stress in both coils, when solid at the same height, will be practically the same.

Fifth. No particular specifications have been prepared for springs for cars of 40,000 and 50,000 lbs. capacity using arch bar trucks, but springs for these cars may be made up from bars

used in the construction of spring "A" for 60,000-lb. cars by removing two or all of the inner coils.

Springs A, E, F and G, as recommended, do not conform exactly to any springs now in service as far as known, but they are of such dimensions that they can be used in place of similar springs now in service. Of springs B, C and D there are about 200,000 in service, and from reports received they have met all requirements, and as they are correctly designed, there is no reason why failures should be anticipated.

It is believed that all of these springs will fully meet the requirements of a majority of the railroads, as well as of the manufacturers of springs, and while there may be certain constructions of trucks for which they will not be suitable, the number of such trucks is not large and they will gradually disappear.

DRAFT GEAR.

Committee—E. D. Bronner, C. M. Mendenhall, Mord Roberts, T. A. Lawes, G. F. Wilson.

The subject assigned to your committee was as follows: "Draft Gear: To report on the requirements of modern freight car draft gear to meet modern conditions; methods of attaching to sills or cars; spring capacity; sizes and strength of parts, excluding the coupler, and to submit recommendations covering principles."

Last year's committee on this subject reported the result of a circular of inquiry, so that the present committee deemed it the more advisable to proceed in a somewhat different manner. The plan of procedure has been to gather data and opinions by correspondence, supplementing this correspondence wherever possible by interviews with members and draft gear makers.

Owing to a number of unforeseen circumstances, the work of the committee was not begun as early as intended, with the result that all the work planned could not be carried out in time for a final report at this meeting. The work remaining relates chiefly to the testing of different draft gears and the submission of certain recommendations which can best be made after the tests are completed. It is proposed to make these draft gear tests this summer.

As regards draft gear for freight cars, the relative conditions now are very similar to what they were about ten years ago and prior to the adoptions of the present recommended practice of the Association for coupler attachments. These conditions were clearly set out in a paper by Mr. C. A. Schroyer before the Western Railway Club in November, 1890, and a paper by Mr. D. L. Barnes in May, 1891, before the New York Railroad Club. Then on account of increases in the size of trains the strength of the draft rigging was being exceeded. It is believed that the present M. C. B. rigging has served a good purpose, but the time has come when it must be strengthened to suit new conditions.

The draft gear failures which have been referred to in discussions during the past year seem to be chiefly breakages of the old riggings which were not designed for the work they are now called upon to do. So far as the committee has observed, several draft gears of recent design are showing good results in service. Of course, in considering any record of this kind it must be borne in mind that most of these gears are practically new and also that they are favored by the large number of old cars with weak draft rigging, which fails first and so relieves the rest of the draft gear in the train. This is mentioned here because there seems to be an impression that most of the draft gears now being applied are inadquate, which has certainly not been demonstrated up to this time.

The use of metal underframing, allowing the draft attachments to be placed between and fastened direct to the sills, is looked on as one of the most important steps which can be taken in car design favorable to the draft gear. Experience so far has shown that with metal underframes the front and back follower stops can best be lugs united in one casting with heavy connecting ribs. This gives a large area in contact with the sills and permits of the use of an ample number of rivets. In several cases where single follower lugs have been used, concentrating the strains on a small area of the sill, the webs of the sills have been badly distorted, and in other cases, where the sills have been reinforced, these single lugs have been sheared off. The committee has heard of no cases of failure of sills where both lugs were on a single casting.

Some anticipate trouble from the greater rigidity of the metal frames. To compensate in the metal underframe for the greater elasticity of wood to absorb shocks, one road proposes to place the flanges of the center sills facing each other and put long timbers in between the flanges, extending the full length of the car. To these timbers the draft attachments are then bolted. Another plan is to use a channel end sill filled with a wooden timber which carries the striking plate. Still another design has been used on small Chicago & Alton cars. In this the draft gear in buffing is reinforced by high capacity spring resistance through a range of about ½ in. Another plan is to use spring buffers. The committee is of the opinion that the introduction of steel underframes will favor the draft rigging, eliminating the troubles from loose attachments due to the shrinkage of wood and the backing off of nuts.

What the committee considers an important principle is that with metal underframes, and wooden cars with low floors, the line of draft should be on the neutral axis of the center sills. It is realized that it is not always possible to place the draft rigging on the neutral axis of the center sills with this construction, but this does not affect the correctness of the principle.

Where the lowering of the car floor is objectionable, the committee recommends that the draft timbers extend at least to the body bolster. There are, however, preferences for continuous draft timbers, and a design in metal, consisting of two unbroken steel channels running from end to end of the car in place of the draft timbers. This is a design of the Lake Shore & Michigan Southern Railway. Another construction recently used by the Chicago, Burlington & Quincy, puts the line of draft on a level with the bottom of the center sill; this avoids cutting away the end sill about the coupler.

There would seem to be no reason why there should not be uniformity in new car construction regarding the spacing of center sills. The present recommended practice of the association is an 8-in. sill spacing. This now seems inadequate, and on account of the general use of both twin and tandem spring arrangements it seems desirable to modify this and settle on two dimensions of sill spacing. The committee suggests 10 ins. and 14 ins. These dimensions are recommended because one or the other will take, conveniently, any of the draft riggings now being used, and will enable two lengths of follower plates to be used instead of a variety of lengths. The 10-in. center sill spacing is ample for underhung rigging of both the twin and tandem types, and the 14-in. spacing will take any rigging attached between the center sills. In metal construction this wider spacing is also required to enable the rivets at the bolsters to be machine driven. It is recommendd that 10 ins. and 14 ins. be adopted as standard distances between center sills.

As showing recent practice in draft gear, drawings are presented in Appendix A (Most of these have been illustrated in our columns.—Editor) of various gears which are now on the market, or are being applied by railroads in accordance with their own designs. It will be seen that with one exception these gears are designed to pull the car from the head end, which seems to be the type of draft gear that is generally preferred, although this one gear is used extensively.

While there are two ways of receiving the pulling forces on the car, through attachments at the front end or through attachments at the rear, the principle of all draft gear as regards buffing forces is alike—i.e., the buffing strains are taken by the draft gear proper until the spring or other resistance is exhausted, when the remainder of the shock is transmitted direct to the car framing through the coupler horn or buffer blocks, if present. In the latest draft rigging, the friction gears, the capacity of the gears to absorb shocks has been increased to between 100,000 and 160,000 lbs., leaving a smaller proportion of shock to be transmitted at the coupler horn, this increased capacity being obtained with practically no recoil. It is readily conceded that the theory of the friction draft gear is correct, but few have had any experience with these gears; they have not been in service long enough to estimate their life or wearing qualities, or in any way determine whether the increased first cost and greater complication is warranted. At the present time the committee has no recommendations to make as between friction and spring gears.

Last year the draft gear committee disagreed as between the tandem and twin spring arrangements. The present committee considers that the arrangement of the springs is largely a matter of preference. Both have advantages and disadvantages. As the tandem arrangement is usually applied, the breaking of one spring does not cripple the rigging as with the twin arrangement; shorter followers can be used with the tandem; the pull is more central and it is easier fitted to old cars with the sills close together. The twin arrangement, on the other hand, permits of a shorter and lighter yoke. In some cases the long leverage of tandem yokes causes trouble by shearing off the rivets which join the yoke to the coupler. The rear spring of the tandem arrangement extends back so far from the end of the car that it cannot be inspected without going under the car, and it is doubtful if the rear spring and follower ever gets much attention from the inspectors. None of these objections are very serious, and the committee in its future recommendations will provide for the use of both twin and tandem spring arrangements. The committee is of the opinion that draft gear of the same capacity should be used on small cars as is used on cars of the largest capacity.

It is found that the M. C. B. draft gear spring, 6¼ ins. in diameter by 8 ins. high, is used generally in spring riggings; at least the dimensions are adhered to and should be retained.

AIR BRAKE HOSE SPECIFICATIONS.

Committee—Jas. Macbeth, H. F. Ball, R. N. Durborow.

It will be noted from the replies received from a number of the roads that a very large percentage of hose is removed on account of unfair usage, and while the committee was not furnished data to show at what point on the hose the failures occurred, we have had access to records which have been carefully kept for the past two or three years, which show that fully 80 per cent. of all hose renewed has failed through chafing or cutting of the inner tube at the end of the nipple or coupling. Very few roads throughout the country have any device in use or have made any provision to overcome this chafing action on the inner tube of the hose, and in view of the committee's findings in this respect, we would recommend that some suit-

able device be used to prevent the injury to the inner tube at the coupling and nipple.

The roads in using specifications are largely overcoming the troubles which they formerly experienced with air hose bursting in trains. That specifications are as necessary in the case of air brake hose as in any other important detail of car design goes without saying, if it is desired to mantain a uniformity in the grade of material purchased. The testing of hose to see that they comply with the specifications is not a difficult task, and it is urgently recommended that specifications be used by all roads in purchasing air-brake hose.

In view of the practical unanimity in essential details of the specifications presented to the committee in response to our circular of inquiry, we would recommend the following specifications for adoption as "recommended practice" of the Association. These specifications do not differ materially in general from those recommended in the able report presented by Mr. A. M. Waitt, at the convention in 1898.

Specifications for Air Brake Hose.

1. All air brake hose must be soft and pliable and not less than three ply nor more than four ply. These must be made of rubber and cotton fabric, each of the best of its kind made for the purpose; no rubber substitutes or short fiber cotton to be used.

2. Tube must be handmade, composed of three calenders of 1/32 in. rubber. It must be free from holes and imperfections in general and must be so firmly united to the cotton fabric that it can not be separated without breaking or splitting in two. The tube must be a high quality of rubber and must be such composition as to successfully meet the requirements of the stretching test given below; the tube to be not less than 3/32 in. thick at any point.

3. The canvas or woven fabric used as wrapping for the hose to be made of long fiber cotton loosely woven, and to weigh not less than 22 oz. per yard, and to be from 38 in. to 40 in. wide. The wrapping must be frictioned on both sides and must have in addition a distinct coating or layer of gum between each ply of wrapping. The canvas wrapping to be applied on the bias.

4. The cover must be of the same quality of gum as the tube and must not be less than 1/16 in. to ⅛ in.

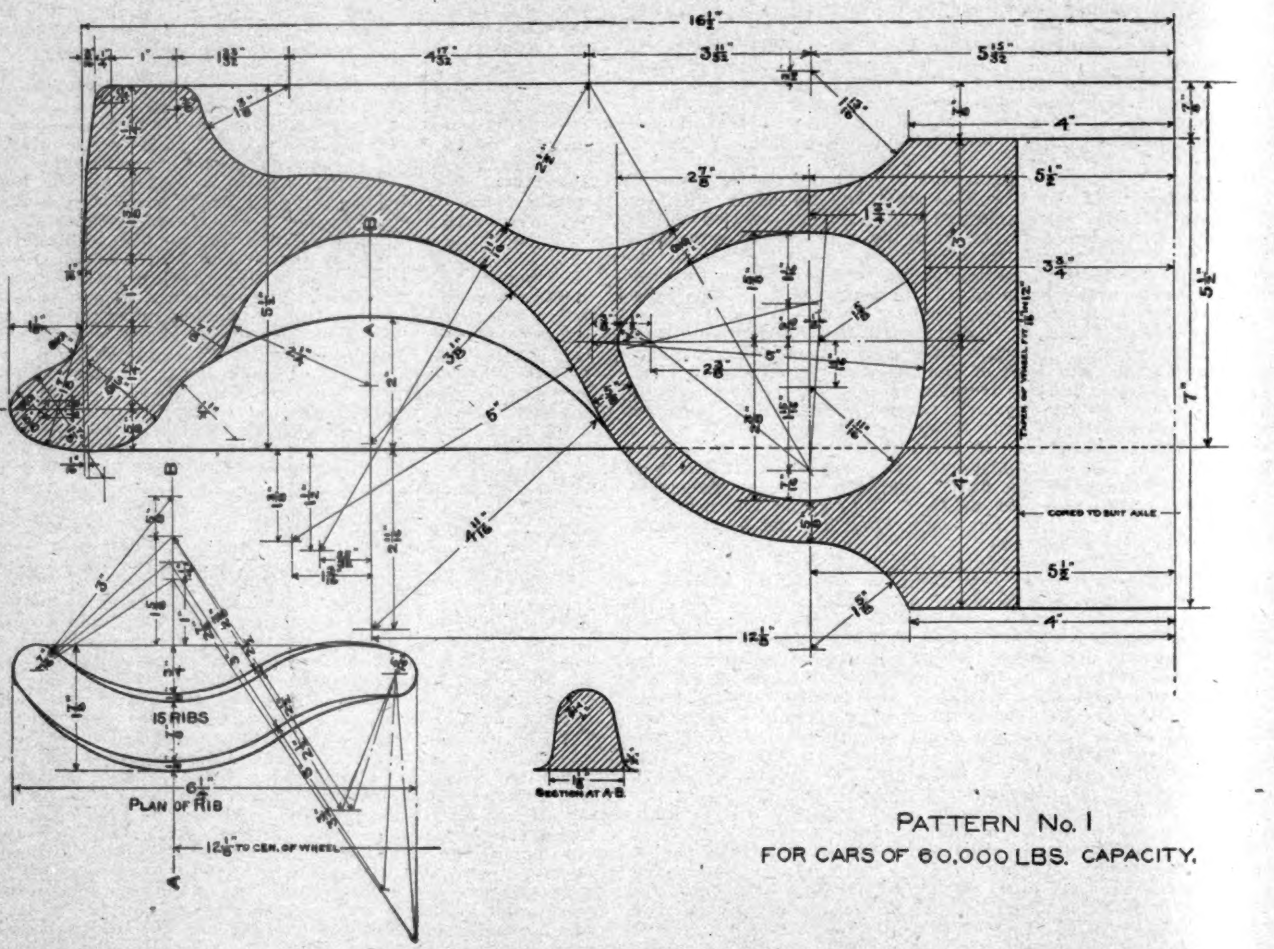
5. Air brake hose to be furnished in 22-in. lengths. Variations exceeding ¼ in. in length will not be permitted. Hose must be capped on ends with not less than 1/16 in. or more than ⅛ in. rubber caps. Caps must be vulcanized on, not pasted or cemented.

6. The inside diameter of all 1¼-in. air brake hose must not be less than 1¼-ins. or more than 1 5/16 ins., except at the ends, which are to be enlarged 3-16 in. for a distance of 2¾ ins., the change from the smaller to the larger to be made tapering. The outside diameters must be kept within the following dimensions: The main part of hose 1⅞ ins. to 2 ins. The enlarged ends 2 1/16 ins. to 2 3/16 ins. The hose must be finished smooth and regular in size throughout as stated above.

7. Each standard length of hose must be branded with the name of the manufacturer, year and month when made, and serial number, the initials of the railway company, and also have a table of raised letters at least 3/16 in. high to show the date of application and removal. Each lot of 200 or less hose must bear the manufacturer's serial number, commencing at 1 on the first of the year and continuing consecutively until the end of the year. For each lot of 200 or less one extra hose must be furnished free of cost for test. All markings to be full and distinct and made on a thin layer of white or red rubber, vulcanized, and so applied as to be removed either by cutting with a knife or sharp instrument.

8. Test hose will be subjected to the following test: Test hose must stand for 10 minutes a pressure of 500 lbs. before bursting. Each hose must stand a shop test of 200 lbs. A section of 1 in. long will be taken from any part of the hose and the friction determined by the force and the time required to unwind the hose, the force to be applied at right angles to line of separation with a weight of 25 lbs. suspended from the separated end; the separation must be uniform and regular when unwinding; the average speed must not exceed 6 ins. in 10 minutes. A 1-in. section of the rubber tube or inner lining will be cut at the lapped or fixed part, marks 2 ins. apart will be placed on it and stretched until the marks are 10 ins. apart, then released immediately. The piece will then be re-marked as at first and stretched 10 ins., or 400 per cent., and will remain stretched 10 minutes; it will then be released and the distance measured between the marks 10 minutes after the relase. In no case must test piece show defective rubber or show a permanent set of more than ¼-in. between the 2-in. marks. Small strips taken from the cover or friction will be taken for the same test.

9. If the test hose fails to meet the required test, the lot from which they are taken may be rejected without further examination. If the hose are satisfactory the entire lot will be examined and those complying with the test will be accepted. All rejected hose will be returned to manufacturers, they paying freight charges both ways.



PATTERN No. 1
FOR CARS OF 60,000 LBS. CAPACITY.

CAST-IRON WHEELS.

Committee—J. N. Barr, Wm. Garstang, J. J. Hennessey, D. F. Crawford, Wm. Apps.

Your committee appointed to investigate and report on the question of locating the inner face of cast-iron wheels to the gauge point, and the thickness of metal between the bore and ring core, and to recommend minimum weights for wheels for use under 60,000, 80,000 and 100,000 pound capacity cars, begs to report as follows:

First. As to locating the inner face of hub of cast-iron wheels to the gauge point. If the outside face of the hub next to the box projects 3 3/16 ins. beyond the gauge point, it will allow a clearance between the face of hub and box of one inch in the normal position. The lost motion between the journal, the brass, the wedge and the box is about ⅝ in. The dimensions given above will afford a clearance of at least ¼ in. between the hub and the box, when all the lost motion between the journal, the wedge, the brass and the box is fully taken up. It is the opinion of the committee that this amount of clearance is sufficient and that no good will be obtained by increasing or decreasing this amount of clearance. So far as the templet for determining these dimensions is concerned, the committee is of the opinion that it is not practical to make the templet to locate the hub with reference to the gauge point, but that the practical method will be to lay a straight edge across the outside of rim, measuring in 15/16 in., which will give the proper location of the face of the hub. It, of course, should be determined that the pattern is so made that the wheel is 5½ ins. over all between the inside of flange and outside of rim, before the measurements referred to above are taken. This applies to 60,000, 80,000 and 100,000 lbs. capacity cars.

Second. As to the thickness of metal between the bore and ring core. It is the opinion of the committee, based on actual experience, that any thickness greater than 1 in. is sufficient and the committee would recommend that a thickness of 1⅛ ins. between the bore and ring core after the wheel is bored, should be made standard for all sizes of wheels. The facts in the case, so far as this committee has information, are that wheels measuring 1 in. to 1 1/16 ins. between the ring core and bore, when the core is finished, have given satisfaction, and so far as the knowledge of the committee extends, it does not know of any case of failure of wheels at this point.

Third. As to the minimum weight of wheels for use under cars of 60,000, 80,000 and 100,000 lbs. capacity, it is the impression of the committee that this is intended to refer to wheels used for repairs of cars in interchange. On this basis the committee would recommend that the minimum weight of wheels used for this purpose should be as follows:

For 60,000 pounds capacity cars	550 pounds
For 80,000 pounds capacity cars	590 "
For 100,000 pounds capacity cars	620 "

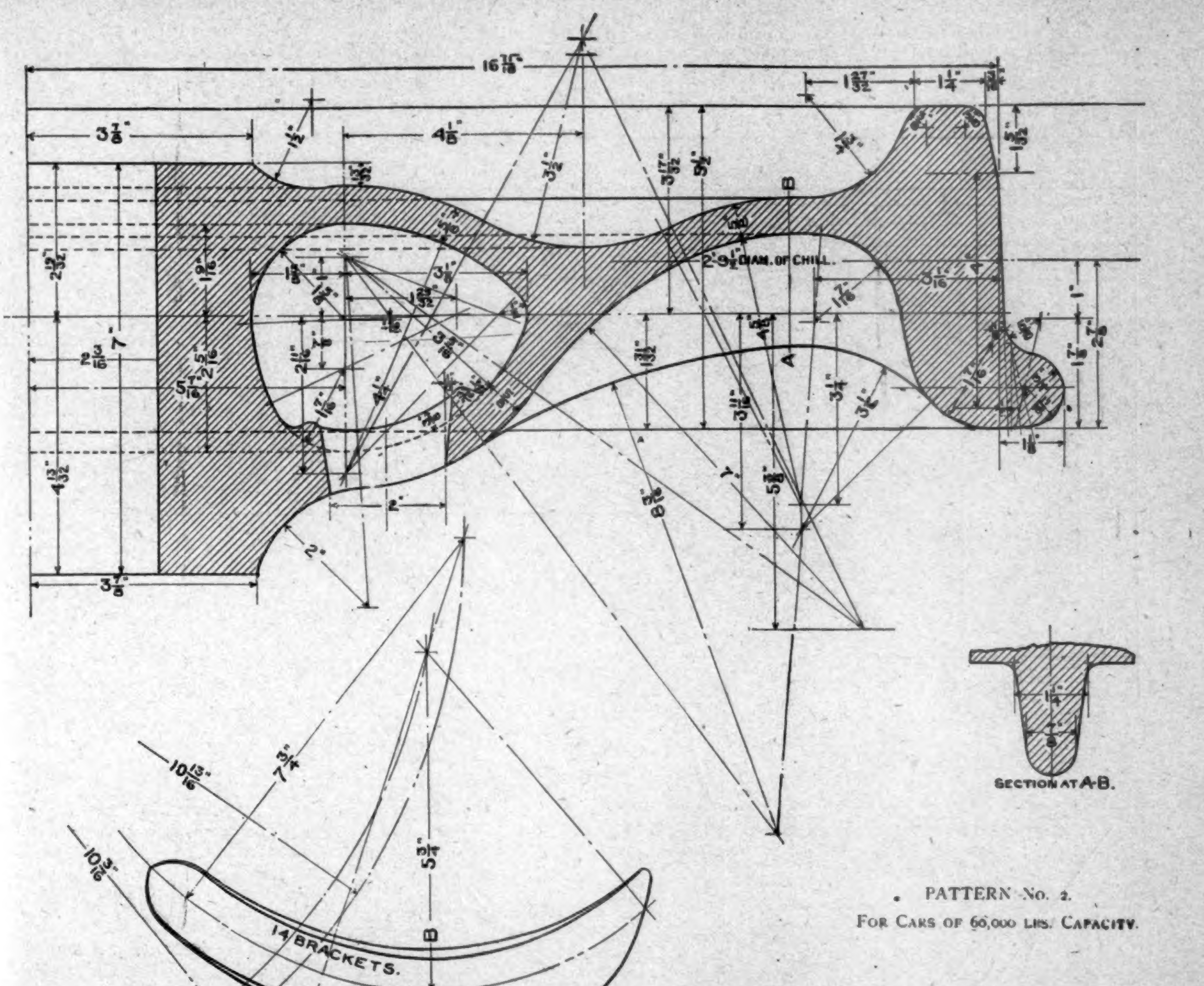
These recommendations apply only to wheels used for the purpose of repairing foreign cars, and as to minimum weight which should be allowed. At the same time, as a matter of experience, it is the opinion that wheels of fair quality and of the weights given will afford satisfactory results.

It is also recommended that commencing September 1, 1901, wheelmakers should be required to have the nominal weight cast on them, and your committee recommends the following weights:

For 60,000 pounds capacity cars	575 pounds
For 80,000 pounds capacity cars	600 "
For 100,000 pounds capacity cars	625 "

The committee would also call attention to the fact that in a number of cases wheel patterns have been increased in weight by plastering on material at points which do not serve to increase the strength of the wheel, but merely to attain in the cheapest way the object of furnishing wheels of a given weight. It is extremely important, in going to a heavier wheel, to have the material so distributed that an actual increase in the strength of the wheel shall be obtained thereby.

In order to throw some light on this subject, the committee attaches to its report four drawings showing two patterns of the 60,000 lbs. capacity wheel, and two patterns of the 100,000 lbs. capacity wheel, which have been in extensive use, and which have given satisfactory results. The patterns Nos. 1 and



PATTERN No. 2.
FOR CARS OF 60,000 LBS. CAPACITY.

2, which are designs for 60,000 lbs capacity wheels, represent a wheel which weighs about 585 lbs.; patterns Nos. 3 and 4, for 100,000 wheels, represent a wheel which weighs about 620 lbs. It is well known that wheels of greater weight than these are used, and your committee has no intention of settling definitely the proper weight, as this is a question which is apparently beyond its jurisdiction.

The question of quality of wheels is so intimately associated with the question of weight that it is impossible to settle this without taking both questions into consideration. It is believed, however, that the wheels of the weights recommended, if made of suitable material, will meet all the requirements of the Master Car Builders' test of wheels, and will in practice afford perfectly satisfactory results.

Note.—Mr. Garstang does not concur with the committee in its recommendation relative to the minimum weights or the drawing showing changes in flange and location of hubs.

UNIFORM SECTION OF SIDING AND FLOORING.

Committee—R. P. C. Sanderson, J. S. Lentz, W. P. Appleyard.

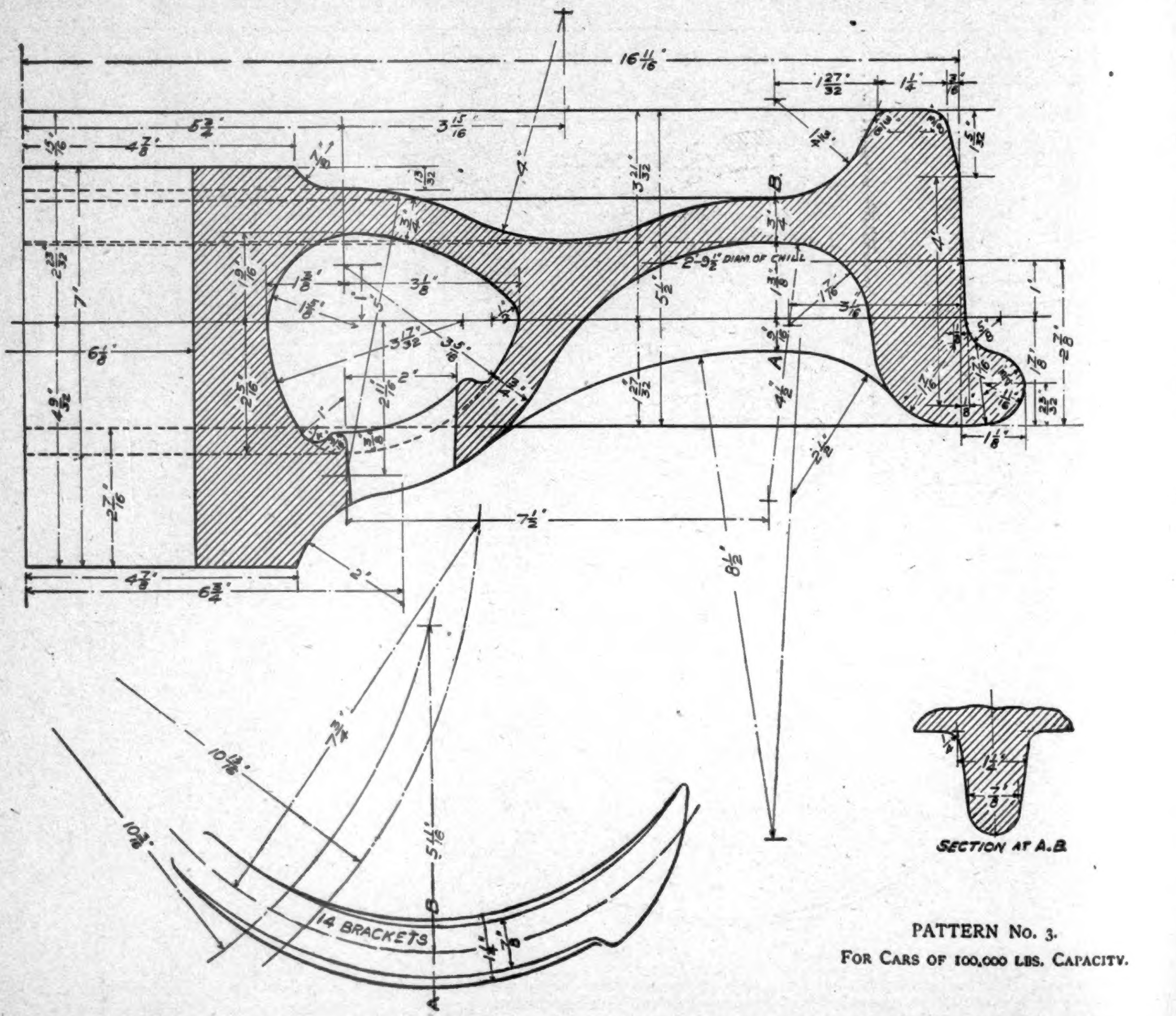
Upon looking into this question, your committee finds that the subject has a very important commercial side as well as a mechanical side and has, therefore, conferred with the lumber men in various parts of the country, as well as with railroad men and some of the great car building concerns.

It has become very evident that if the Master Car Builders' Association and the car builders generally would adopt and use sections for flooring and siding, roofing and lining, which approximated closely as far as rough sizes are concerned, the commercial sizes put in buildings, a reduction in price per thousand feet could reasonably be expected, and orders could be filled more promptly. In explanation of this it is well to state that only a limited number of the large lumber dealers do their own logging and cut logs to the proper sizes for car lumber. Most of the logging in the country is done by lumbermen, and as quite a considerable proportion of the logs are hewed in the winter, to be brought down by the spring freshets and taken to the mills in the summer, the cutting of the logs is not easy to control. Further, if we used rough sizes that are commercial, and lumber sawed to such sizes when not up to the Master Car Builders' specifications will be valuable for commercial puroses, there will be no loss to the lumber men. Several of the firms with whom we corresponded further stated that if the requirements of the Master Car Builders could be made to better suit the lumber mill practices in current usage, a saving of $1 per thousand could unquestionably be made in the price. This also refers to the question of using siding and roofing of varying widths as against one uniform width of six inches, which is commonly used and required by many railroads.

Your committee has been in correspondence with the Barney & Smith Car Company, the American Car & Foundry Company, the Pullman Company, and the Southern Car & Foundry Company, and has investigated the matter at railroad shops and planing mills, and after a thorough review of the whole matter, we present herewith recommendations for "flooring ship-lapped"; "flooring square-edged"; "siding, roofing and lining," which we think will meet all the suggestions advanced by the lumber men previously mentioned, and at the same time will be generally acceptable to the car builders and mill men:

Flooring.

To be of two kinds—square-edged, dressed all over, or ship-lapped, dressed all over, in accordance with the sections shown.



PATTERN No. 3.
FOR CARS OF 100,000 LBS. CAPACITY.

In explanation of these recommendations it is to be remembered that the lumber from which this flooring is to be made is commercial size, sawed 2-in. in thickness, and ranging from 5 ins. to 10 ins. in width. For the reasons previously mentioned, the mill men can furnish flooring of random widths ranging from 5 ins. to 10 ins. in the rough at a cheaper price than they can flooring of one uniform width, and as this 2-in. lumber of the width mentioned is commercial material, that which will not cut to lengths for car builders' work, or does not come up to the specifications required for car building, can be cut and used for other building purposes. The lumber men assure us that the percentage of narrow stuff will be small as compared with the percentage of wide. Of course, it would not be expected that miscellaneous widths would be used in the same cars, but as the flooring is run through the mill, the dif-

ferent widths can be stacked separately, uniform widths being used on different cars.

It was suggested from several quarters that the ship-lap should be so arranged that the upper part would be 1 in. thick and the lower part ¾ in. thick, so as to give greater wearing life to the floor. Your committee, however, felt that it was better not to do this, because it is desired to have the best surface up, and by making the ship-lap centrally, the best side can always be turned up, and thus make a better looking and better wearing floor, and it is assumed that when the floor is nearly worn down to the ship-lap, the flooring will have to be renewed, as it is then too thin for service in modern, heavy cars.

Siding, Roofing and Lining.

Your committee thinks it best to recommend that the same section of material be used for siding, roofing and lining, and that the tongue and groove be placed centrally, so that either side of the material can be used as a face side. The purpose of this is that both at the commercial and railroad mills all the material of this character can be run through the planers and matchers without changing knives. Then it can be assorted according to quality, the best of it being used for siding, the less perfect for roofing, and the poorest quality for lining. By making the tongue and groove centrally we think the roofing and lining lumber can be used with the flat surface out, while for the siding it can be used with the beveled edges out. There is no waste of labor in doing this, because cutting the bevel edges requires a second pass through the machine and does not cost anything additional. This siding, roofing, and lining is intended to be made from regular commercial 1-in. sawed stuff, and to be dressed from 6-in. and 4-in. widths to match up 5¼-in. and 3¼-in. By accepting material of the two widths and stacking them separately, this lumber can be obtained at a cheaper price and obtained more quickly. We find that it is the practice of many car builders to do this, using material of one width only in one car, while the roofing and lining the lumber used does not make any material difference. It is true that more nails will be required with the narrower widths, and there will be some more loss with the narrower widths on account of the additional number of joints per car, but the mill men are prepared to furnish the material already matched for less money per thousand feet. The mill men claim that it is becoming very difficult to get large quantities of lumber of the right specifications in the greater widths and it is believed to be wise at the present time to concede this point and agree to accept lumber for siding, roofing and lining made from the rough of the two widths, namely, 4-in. and 6-in.

(Concluded next month.)

EXHIBITORS AT THE SARATOGA CONVENTION.

The following is a list of the principal exhibitors at the recent conventions of the M. M. and M. C. B. Associations:

American Brake Shoe Company, Chicago.

American Locomotive Sander Company, Philadelphia, Pa.

American Steel Foundry Company, St. Louis, Mo.

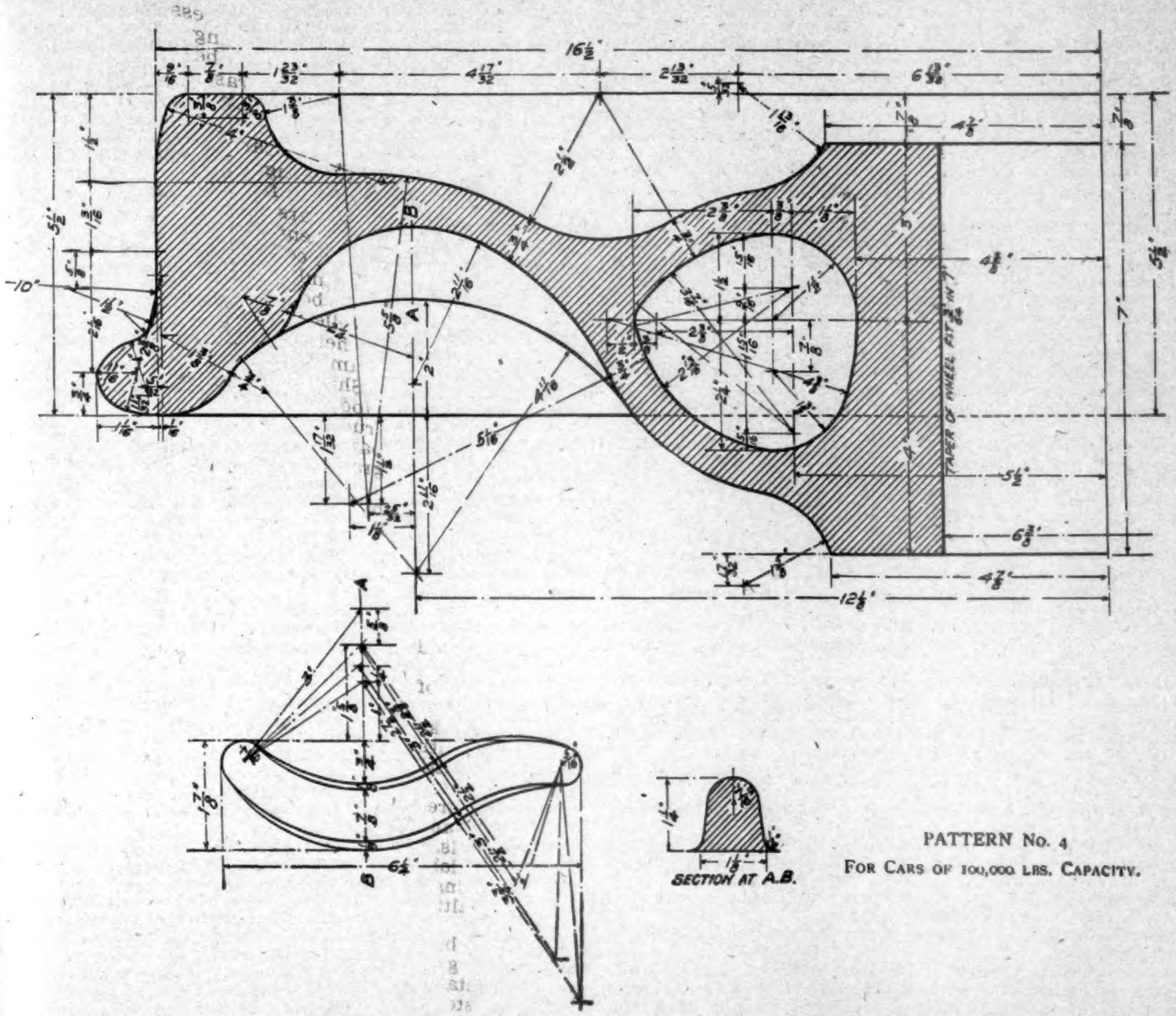
American Watchman's Time Detector Company, The, New York, N. Y.

Atlantic Brass Company, New York, N. Y.

Auto Coupler and Supply Company, Cincinnati, O.

Ball, Webb C., Company, The, Cleveland, Ohio. Watches specially adapted to the use of railroad service.

Baltimore Ball Bearing Company, Baltimore, Md. Norwood ball side bearing, balls made from hardened steel.



PATTERN No. 4

FOR CARS OF 100,000 LBS. CAPACITY.

Bettendorf Axle Company, Chicago, Ill. Bettendorf truck and body bolsters for 30 and 40 tons cars and structural steel underframe, press steel center still, structural steel car on the D. & H. tracks.

F. W. Bird & Son, East Walpole, Mass. Torsion proof car roofing.

R. Bliss Manufacturing Company, Pawtucket, R. I. Wood's patent safety gate.

Bordo Valve Company, Coatesville, Pa. The Bordo locomotive blow-off valve and swing joint.

The Boston Belting Company. Samples of air brake, steam and water hose.

Brill Company, J. G., Philadelphia, Pa. Car trucks.

Buckeye Malleable Iron & Coupler Company, Columbus, O. The Major automatic coupler and Buckeye draft gear attachment to be used when the link slot and pin hole is abandoned.

Butler Draw-bar Attachment Company, Cleveland, O. Various types of tandem draft attachments.

Carborundum Company, Niagara Falls, N. Y. A full line of carborundum goods, such as carborundum wheels, paper, cloth, carborundum grains and other specialties.

Chicago Pneumatic Tool Company, Chicago, Ill. Exhibiting

Chicago reversible drills in five different sizes. Boyer drill, two sizes; Chicago rotary drill, four sizes; flue cutters, flue welders, Chicago piston breast drills, Chicago rotary breast drills, Boyer long stroke riveting hammer, Boyer chipping and calking hammer, Chicago painting machine, Chicago oil rivet forges, Boyer yoke riveters, Chicago staybolt chuck, Ford dolly bars, pneumatic holder-on, Duntley drills, electric headlights and motors.

Chicago Railway Equipment Company, Chicago, Ill. National Hollow, Kewanee, Diamond and Central brake beams, Automatic Frictionless Side Bearings, and a specially adapted brake beam for high speed brake service.

Cleveland City Forge & Iron Company, Cleveland, Ohio. Turnbuckles and drawbar pockets.

Columbus Pneumatic Tool Company, Columbus, O. U. and W. piston air drills and Columbus flue cutters.

Consolidated Car Heating Company, Albany, N. Y. Steam heating apparatus under steam, steam couplers, steam traps, etc., and electrical heating apparatus.

Consolidated Railway Electric Lighting & Equipment Company, New York, N. Y. Electric lighting generating apparatus, the Lindstrom lever brake for railway cars, a combination baggage and smoking car electrically equipped and lighted, and a refrigerating car.

Crane Company, The, Chicago, Ill. The new Crane locomotive muffler pop safety valve, gun metal globe and angle valves and blow-off valves for high steam pressure.

Crosby Steam Gauge & Valve Company, Boston, Mass. Locomotive gauges, pop safety and other valves.

Dayton Malleable Iron Company, Dayton, O. Dayton draft gear, Dayton patent car door fastener, lubricating center plate, brake levers and brake wheels.

Detroit Lubricator Company, Detroit, Mich. Detroit lubricators, style 3-C, automatic steam chest plugs as shown on souvenir.

Economy Car Heating Company, Portland, Me.

Economy Railway Equipment Company, New York, N. Y. Exhibiting the Economy flush car door and the Economy exhaust nozzle.

Edwards Company, The O. M., Syracuse, N. Y. Window models showing three designs of windows comprising recent improvements, four models of extension platform trap doors for wide vestibules and open platforms for railway coaches.

Franklin Manufacturing Company, Franklin, Pa. Monarch sectional train pipe coverings and asbestos products.

Garry Iron & Steel Company, Cleveland, O. Revolving pneumatic crane.

Général Electric Company, Schenectady, N. Y. Seven H. P. variable speed motor direct-connected to boring mill, illustrating method of operating machine tools by direct-connected variable speed motors.

Gould Car Coupler Company, 25 West 33d street, New York, N. Y. Showing passenger and freight slack adjusters, improved M. C. B. journal boxes, improved malleable draft rigging for freight equipment with spring buffer blocks; improved M. C. B. coupler for 100,000-lb. car and improved locomotive tender coupler for heavy equipment.

Hammett, H. G., Troy, N. Y. Richardson and Allen-Richardson balanced slide valves, oil cups, "Sansom" bell ringer, link grinders, etc.

Handy Car Equipment Company, Chicago, Ill. Full size Snow locomotive and car replacers. Also a sample Handy car.

Harrison Dust Guard Company, Toledo, O. Exhibiting the Harrison dust guard in the four following sizes: 40,000, 60,000, 80,000, 100,000 lbs. capacity, Tunks uncoupling lever.

Homestead Valve Manufacturing Company, Pittsburg, Pa. Locomotive blow-off valves.

Jackson, James W., New York, N. Y. The Nixon safety staybolt sleeve.

Keasbey & Mattison Company, Ambler, Pa. Magnesia locomotive lagging and asbestos materials, including valve and piston packings of various kinds.

Klein, August, Utica, N. Y. Replacer of derailed cars and locomotives for steam or street railroads.

Laidlaw-Dunn-Gordon Company. Models and photographs of air compressors.

Lappin Brake Shoe Company, Bloomfield N. J. Lappin brake shoes with and without steel backs, Congdon brake shoes with various types of inserts with the standard Lappin back and with the Lappin bridge back and interlocking brake shoes.

Locomotive Appliance Company, Chicago, Ill. The Allfree valve gear, Allfree cut-off adjuster, Plano convex valves and Davis system of counterbalancing locomotive driving wheels.

Lunkenheimer Company, Cincinnati, Ohio. Injectors, globe valve and swing chock valves, rod caps and locomotive fittings.

Mason Regulator Company, Boston. Mass. Steam specialties and Mason locomotive reducing valves.

McCord & Co., Chicago and New York. McCord journal box, McCord spring dampener, Johnson hopper door, McKim gaskett and seamless copper ferrules, Torrey anti-friction metal.

Manning, Maxwell & Moore, New York, N. Y.—Ashcroft steam pressure and vacuum gauges, air brake gauges, Consolidated pop safety valves, both incased and muffled, water relief valves, Metropolitan locomotive and stationary injectors, H-D ejectors, hose strainers and check valves, Hancock locomotive, composite and stationary inspirators, boiler washers, ejectors, main steam valves, main check valves, double check vales, hose strainers and hose couplings made in various forms.

Metal Dust Guard Company, Baltimore, Md. Metal, flax and hair felt dust guards.

Metal-plated Car and Lumber Company, New York, N. Y. Section of a metal-plated car, sheet copper.

Michigan Lubricator Company, Detroit, Mich. Michigan improved triple lubricator No. 3 and automatic steam chest plugs, also air pump cup.

Monarch Brake Beam Company, Ltd., Detroit, Mich. Monarch and Solid brake beams, and new interlocking fulcrum for the solid beam.

Moran Flexible Steam Joint Company, Louisville, Ky. Large joints and all-metal steam-heat couplings.

National Lock Washer Company, Newark, N. J. Car windows, equipped with National sash lock and balance.

National Car Coupler Company, Chicago, Ill. Freight coupler, tandem draft rigging with spring steel followers, steel platform and continuous platform buffer.

National Malleable Castings Company, Cleveland, Ohio. Tower coupler.

National Railway Specialty Company. The "N. R. S." hose clamp, the National adjustable journal bearing.

New York & Franklin Air Compressor Company, New York. A straight line steam-driven air compressor.

Norton, A. O., Boston, Mass. Ball bearing lifting jacks, journal, bridge and track jacks.

Norton Emery Wheel Company, Worcester, Mass. Piston-rod and crank-pin, ground from rough turning of lathe.

Pearson Jack Company, Boston, Mass. Pearson car replacing jacks, King bolt clamp, ratchet pulling jacks, ratchet journal jack, Goodwin brake beam clamps, U. S. car pusher.

Powers Regulator Company, Chicago, Ill. Automatic temperature regulator for railway passenger cars.

Railway Appliances Company exhibit Sargent coupling for handling cars around curves, the Gilman-Brown emergency knuckle, the O'Brien emergency knuckle, the diamond "D" knuckle of extra hardness and durability, Economic metallic packing, the Best car and engine replacer.

Railway Fuel Economy Company, New York, N. Y. The Bates fire door.

Railroad Supply Company, Chicago, Ill. Hien coupler, Hien friction gear, Avery acetylene car lighting system, pressed steel box lids.

Ramapo Foundry Company, Mahwah, N. J. Licensees for the American brake shoe.

Rand Drill Company, New York. Imperial types Nos. 10 anl 11 Rand compressors.

Roller Bearing and Equipment Company, Keene, N. H. Samples of roller bearings for cars, Downing car wheel clamp for removing brasses.

St. Louis Car Company, St. Louis, Mo. Spiral journal bearings.

Safety Car Heating and Lighting Company, New York, N. Y. Exhibiting car lighting and heating apparatus. The new features are fancy deck lamps, bracket lamps, gas ranges for private cars and buoy lantern.

Sargent Company, Chicago, Ill. Steel castings of Tropenas metal, consisting of wrenches, hammers, coal picks and oil cups.

Seamless Steel Tube Company, Detroit, Mich. Seamless steel boiler tubes.

Sellers, Wm., & Co., Philadelphia, Pa.

Shelby Steel Tube Company, Cleveland, O. Cold drawn seamless steel boiler tubes.

Shickle, Harrison & Howard Iron Company, St. Louis, Mo. Model of standard S. H. & H. truck and body bolster, Player truck and body bolster, Ajax truck, Leeds pilot coupler, Davis patented counterbalanced driving wheel center, also photographs of their new steel plant.

Simplex Railway Appliance Company, Chicago. Simplex bolsters for 80,000-lb. capacity cars, also for 60,000-lb. cars. Susemihl frictionless roller side bearing.

Standard Acetylene Lighting Company, Springfield, Mass. Exhibiting car "Roland."

Standard Car Truck Company, Chicago, Ill. Models of Barber trucks for steam and electric cars, models of freight car truck with center plate designed to keep out dust and cinders.

Standard Coupler Company, New York. Standard steel platforms, Session's standard friction draft gear, Standard couplers.

Standard Pneumatic Tool Company, Chicago, Ill. "Little Giant" pneumatic long stroke riveting hammer, pneumatic chipping, calking, beading hammer, piston air drills, reversible fine rolling, reaming and tapping machines, reversible boring machines, hand yoke riveter, staybolt nipper, pneumatic blow-off cock, pneumatic bell ringers, air hoists, steam pipe grinders, right angle attachment, pneumatic holder-on, pneumatic wood chiseling tool.

Star Brass Manufacturing Company, Boston, Mass. Air and steam gauges, chime whistles, pop valves, recording gauges, complete line of fittings for locomotives and steamships.

Symington, T. H., & Co., Baltimore, Md. Journal boxes and dust guards.

Thornburgh Coupler Attachment Company, Detroit, Mich. Coupler attachments for all classes of equipment, either with single, double or triple springs, with or without metal draft arms.

Western Railway Equipment Company, St. Louis. Combination lug and follower casing, Economy slack adjuster, tandem combination lug and follower, sill and carline pocket, bell ringer, Western flush door, interchangeable door, safety and security truck and casting, the Mudd sander, the Lindstrom non-freezing suction pipe, St. Louis flush door, Acme pipe clamps, Downing card holder, Acme tender pocket, lugless draft beams, side bearings.

Williams Safety Car Window Company, St. Johnsville, N. Y. Two models of car windows and two sectional models of window showing inside mechanism.